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- Comp
- Exact factor
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- Composition
- Level 3: Try harder to find a match by converting bases to their S.I. compositions.
- Level 2: Try to find a match by converting units to their bases.
- Level 1: Convert if they match the composition of another unit.
- Don't convert at all, display as a combination.
- [Xmin][Xmax]
- Grid On/Off
- [Ymin] [Ymax]
- [
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- Entry Display

Creating A Button

Buttons are the building blocks of calculators. You may create your own buttons and add them to any calculator. All buttons fall into one of three different types:

Button Type	Use
Number	Used for constant buttons and storage registers.
Operator	You may assign a series of numbers and operators to this button. It will become an operator like **[+]** or **[TAN]** .
Unit	Used for unit conversions. See Unit Conversions for more information.

Creating a button

To create a new button, follow these steps:

1. From the **File** menu, select **New Button**...

   The Button Properties dialog box will appear.
2. In the **Title** edit box, enter the name you want to appear on the button.
3. In the **Hot-Key** edit box, specify a hot-key which can be used to quickly execute your new button.

   The hot-keys for buttons are limited to any key on the keyboard, except extended keys such as F1-F12, insert, delete, etc. **PentaCalc Pro** will also accept ctrl + any key not on the extended keyboard as a hot-key.
4. Select the type of button you would like to create: **Number**, **Operator**, or **Unit**.
5. Select **[OK].**

   The mouse cursor will change to the outline of a button.
6. Place the new button outline on one of **PentaCalc Pro**'s calculators and click the left mouse button.

   The new button will be set in place.

Using special characters with buttons

Please see the manual for the list of special characters.

See Also: Editing a Button, Deleting a Button

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Editing A Button

This section explains the basic method of editing a button. As you create buttons, you may drag and drop those buttons to more than one calculator. For example, if you create an operator button **[STICKS]** on the programming calculator and then drag it to the scientific calculator, **PentaCalc Pro** will make an exact copy. You may then modify the operator contents, name, or hot-key of **[STICKS]** on one of the calculators without changing the other.

Many of the buttons shipped with **PentaCalc Pro** are created buttons, meaning they were "built" using the tools provided by **PentaCalc Pro**. For example, all of the unit conversion buttons are created buttons. All other buttons are hard-coded, meaning they are programmed into **PentaCalc Pro** as part of the application and may not be modified by the user. Examples of hard-coded buttons are **[TAN]** and **[PV].**

You can drag and drop most hard-coded buttons; however, there are several hard-coded buttons you cannot move. These are 0-9, **[( ], [ )], [SWAP]**, **[DROP]**, **[=]**, **[Enter]**, **[/]**, **[.]**, **[:]**, **[Time]**, **[Date]**, **[Graph]** and **[,]**

Unlike created buttons, if you change the name of a hard-coded button on one calculator **PentaCalc Pro** will change the name of that button on all calculators. The function, of course, will remain the same.

To edit a button, follow these steps:

1. Highlight the button you would like to edit by clicking on it with the right mouse button. Then do one of the following to bring up the button properties box:

   a. Click again on the right mouse key.

   -OR-

   b. From the **File** menu, select **Button Properties...**
2. Once the "Button Properties" dialog box appears, you may change the buttons name, hot-key, or Locked status.
3. After making the desired changes, select **[OK]**.

See Also: Creating a Button

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Creating Custom Calculators

PentaCalc Pro makes it easy to create or modify your own calculators and buttons. You can add buttons to an existing calculator or create your own calculator and buttons. You can even drag and drop buttons from existing calculators into your new creation. For example, if you use certain buttons from the scientific and financial calculator on a regular basis, you can create your own calculator with these buttons. In addition, you can create a calculator with your favorite engineering, scientific, or business formulas.

The building blocks of **PentaCalc Pro** are the individual calculators supplied by Headgate or built by you. The ability to create new calculators gives you ultimate flexibility to customize **PentaCalc Pro** exactly the way you like. Once you create a calculator, it will automatically appear on the Calc menu and may be loaded and used like any other calculator.

Click on one of the topics below for more information:

- Creating a Calculator
- Editing a Calculator
- Deleting a Calculator
- Creating a Button
- Editing a Button
- Locking/Unlocking a Button
- Deleting a Button
- Using Storage Buttons
- Using Operator Buttons

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Introduction to PentaCalc

Welcome to **PentaCalc Pro** for Windows. **PentaCalc Pro**, the second generation of PentaCalc, is a product that has been enhanced as a result of hundreds of suggestions from PentaCalc users. **PentaCalc Pro** is a comprehensive Windows based application used for everyday quick or in-depth calculations. You can customize **PentaCalc Pro** to your own personal style, including creating your own calculators.

- What's New in **PentaCalc Pro**
- How To Use The Manual
- System Requirements
- First-time Setup
- Removing **PentaCalc Pro**
- If You Need More Help...

Top

Using PentaCalc Pro

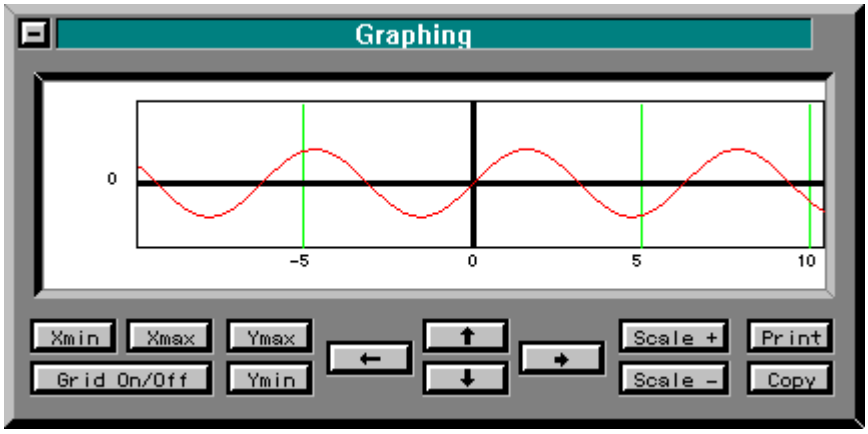
The purpose of the following choices is to acquaint you with the differences between **PentaCalc Pro** and a handheld calculator and to explain some of **PentaCalc Pro**'s functions that are similar to other calculators you may have used in the past.

- Selecting a Calculator
- Interface Overview
- Entry Notations (Algebraic, RPN and 10-key)
- Common Operations
- Base Conversions
- Unit Conversions
- Setting Warning Messages
- Using **PentaCalc Pro** with Any Windows Application

Top

Graphing Calculator

Click on the part of the calculator where the appears for a brief description or select a topic below the calculator for detailed information.



We all have heard that "a picture is worth a thousand words". **PentaCalc Pro** makes it easy for you to graph expressions or equations. Click on one of the following to learn more about:

- Creating a Graph
- Viewing a Graph
- Modifying a Graph
- Printing a Graph
- Copying a Graph

Top

Financial Calculators

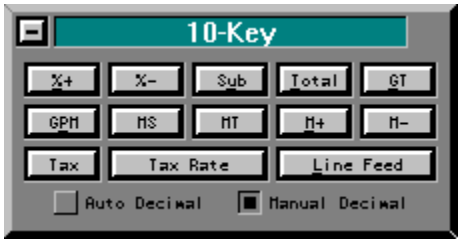
PentaCalc Pro comes with a robust set of tools for calculating almost any type of financial problem. To use one of the financial calculators, you may select it from the Financial submenu of the Calc menu. Click on one of the following topics to learn more about the calculator:

- Time Value of Money
- Cash Flow
- Depreciation
- Business
- Bond

Top

10-Key Calculator

Click on the part of the calculator where the appears for a brief description or select a topic below the calculator for detailed information.

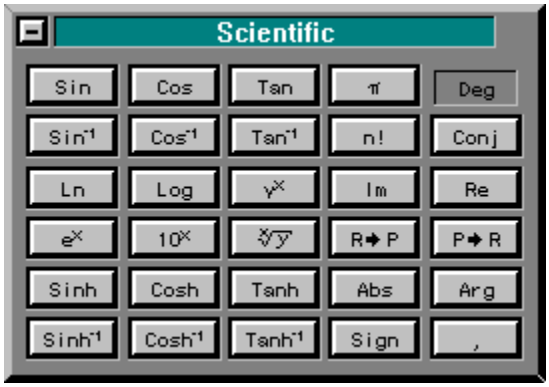


- Overview
- Configuring the Calculator
- Calculating Subtotals, Totals and Grand Totals
- Memory Functions
- Calculating Percentages
- Calculating Tax
- Calculating Gross Profit Margins

Top

Scientific Calculator

Click on the part of the calculator where the appears for a brief description or select a topic below the calculator for detailed information.



- Trigonometric functions
- Logarithmic, Exponential, and Hyperbolic Functions
- Rectangular and Polar Conversions
- Complex numbers

You may work with degrees, radians, and grads and several different bases. Access the Scientific calculator from the Scientific subgroup on the Calc menu.

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Unit Conversions

The unit conversion capabilities of **PentaCalc Pro** are comprehensive and flexible. The unit conversions calculator actually consists of over forty different calculators, each of which represent a different type of unit. Within each unit calculator, there are buttons representing each unit within the type found on that calculator. For example, Length is a unit type, and meters, feet, and inches are units within the type. If you are not able to find a particular unit, you can create a new unit or unit type.

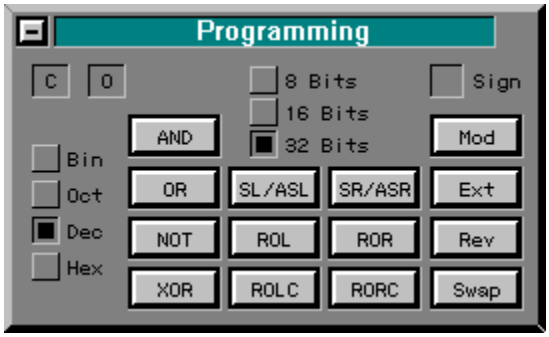
In addition to being able to create your own units, **PentaCalc Pro** contains Smart Units which automatically perform dimensional analysis of units. **PentaCalc Pro**'s Smart Units will convert the units to the appropriate number of significant digits, making sure your data is always accurate. Click on one of the topics below:

- Overview
- Creating Units
- Configuring Smart Units

Top

Programming Calculator

Click on the part of the calculator where the appears for a brief description or select a topic below the calculator for detailed information.

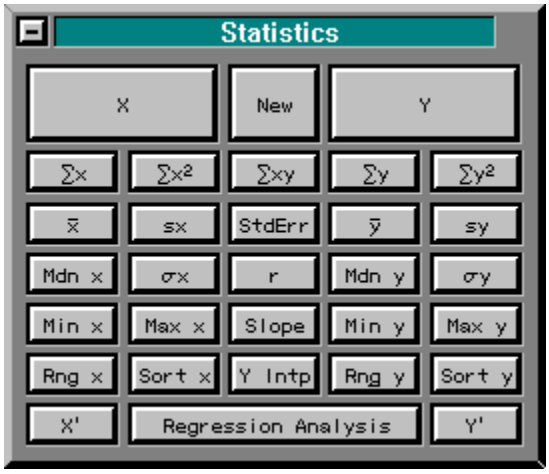


- Overview
- Basic Operations
- Word Size
- Bases
- Sign
- Carry and Overflow Flags

Top

Statistics Calculator

Click on the part of the calculator where the appears for a brief description or select a topic below the calculator for detailed information.



- Overview
- Entering Data
- Importing Data From Other Applications
- Viewing and Editing the List
- Single Variable Statistics
- Regression Analysis

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First-Time Setup

The first time you run **PentaCalc Pro**, A "First-time Setup" box will be displayed. You have the following options:

- **Activate/Deactivate key:** You may select a key or key combination to bring **PentaCalc Pro** to the top of the desktop instantly. For more information on this feature, see Clipboard support for **PentaCalc Pro**.
- **Run PentaCalc Pro automatically when you start your machine:** We recommend you select this option which allows **PentaCalc Pro** to load as a minimized icon when you start your machine. This will make **PentaCalc Pro** instantly accessible by pressing a user defined hot-key. **PentaCalc Pro** is designed to use a very small fraction of your system resources and memory. This allows you to have **PentaCalc Pro** running at all times with insignificant degradation to your system's performance.
- **Replace the Windows calculator with PentaCalc Pro:** If you select this option, all applications that would normally run the Windows calculator, such as Quicken or Managing Your Money, will run **PentaCalc Pro** instead.
- **Entry Mode:** You may select Algebraic, RPN or 10-key entry notation. If you select 10-key, **PentaCalc Pro** will also be set to Fixed 2 display format.

[%+] Add-on Percentage
Computes the percentage of a number with an add-on.

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If you need more help...

Using On-line Help

You'll find on-line help useful in **PentaCalc Pro**. Help appears in a separate window with its own menu bar and controls. There are two ways to display the Help window:

Press F1

PentaCalc Pro's context-sensitive help feature can be accessed at any time by pressing **F1**. The cursor will change to a question mark and arrow. You may then choose the calculator button or menu item you wish to know more about by clicking on it with the mouse.

Choose a command from the Help menu. The Help menu offers several options:

- Get **Help On...** performs the same function as pressing the **F1** key.
- Contents displays the contents of **PentaCalc Pro** topics. To view help for a particular topic, click the word or phrase.
- How to use Help provides information about using the Microsoft Windows help system. To view help for a particular topic, click the word or phrase.
- About **PentaCalc Pro** gives the version number and other information about **PentaCalc Pro**.

Technical support

If you are unable to find the answer to your question using the manual or the on-line help system there are several methods of contacting Headgate technical support.

Telephone

It is Headgate's policy to provide unlimited free telephone technical support. You may call Headgate technical support Mon-Fri between 8:00 a.m. and 5:00 p.m. Mountain Standard Time. You may also fax your questions directly to Headgate technical support at the fax number listed below.

Technical Support Numbers: PH: (801) 693-3246
Fax: (801) 298-9169

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New in PentaCalc Pro

If you have used PentaCalc, you will notice that we have added several new features to **PentaCalc Pro**. The following new features give you greater flexibility to calculate the way you like:

- You can now custom build your own calculator by simply dragging and dropping buttons to a new calculator that you create. You may also build your own custom buttons with functions that are unique to the work you do every day.
- The tape display and keyboard are resizable with four different scales to make **PentaCalc Pro** as big or as small as you want regardless of what video resolution you are running. The tape also keeps a record of all operations making editing and recalculating even easier.
- All calculator interfaces may "stick together" so you can have many or few showing at any given time.
- You'll now find a Quick Copy/Paste feature that automatically takes the number in the display and inserts it at the cursor position of the previous application. You may also use Quick Copy/Paste to copy a number from any application and paste it into **PentaCalc Pro**'s display. This means no more cumbersome and lengthy hot-key combinations to copy to and paste from the clipboard.
- Just for fun, we have added texture mapping. It is possible to create a wood calculator with granite or marble buttons. We have also included many other textures for u to use.
- As the most comprehensive and flexible Windows based calculator on the market, **PentaCalc Pro** now has unlimited user defined hot-keys to instantly bring **PentaCalc Pro** to the front of your desktop.
- **PentaCalc Pro** gives you the choice between Algebraic, RPN or 10-key notation in any calculator.
- The graphing feature makes it possible to plot a graph of any one variable expression and then print or copy the image to the clipboard. This feature is perfect for making your next report or presentation a little more clear.

We have increased the number of functions on the existing PentaCalc calculators and added a few extra calculators as well:

- The scientific calculator now has rectangular-polar conversions and complex numbers.
- New financial calculators include bonds, depreciation, interest rate conversions, markup/markdown and percentage calculations.
- The 10-key calculator has been expanded to include all functions found on regular desk-top adding machines such as: round up/down and 5/4 rounding; negative numbers in red, gross profit margin, grand total, memory registers and item counters.
- The statistics calculator now includes common two variable statistics, including linear regression analysis.
- The selection of units in the unit conversion calculator has been expanded along with the addition of Smart Units that automatically keep track of your unit dimensional analysis. You will no longer need to cancel units when working with units of different dimensions. **PentaCalc Pro** also allows you to add units and change values (a handy feature for currency conversions).
- The new programming calculator contains all logical operations and numerical bases, essential tools for any programmer.

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Removing PentaCalc Pro

If you need to remove all or some of **PentaCalc Pro**, use the uninstall application. Uninstall will remove the files you specify and make the following changes:

- Remove modifications (if any) made to the AUTOEXEC.BAT and WIN.INI files during installation.
- Rename the Windows calculator if you chose to have **PentaCalc Pro** replace the Windows calculator on installation.
- Delete the **PentaCalc Pro** directory (usually C:\PCALCPRO) and all of its files.
- Removes the **PENTACALC PRO** group from the program manager.

To uninstall PentaCalc Pro:

1. Start Windows.
2. Insert the **PentaCalc Pro** program disc into CD/DVD drive.
3. Choose **Run...** from the program manager **File** menu and choose UNINSTAL in the "Run" dialog box. Then click [OK].
4. Follow the on screen instructions to complete the uninstall process.

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How To Use The Manual

Conventions

The **PentaCalc Pro** User's Manual uses consistent visual cues and standard text formats to help you locate and interpret information easily. These conventions are explained as follows.

This	Represents
[Button]	Any button on **PentaCalc Pro**'s interface and dialog boxes.
Bold	Menu titles or items and text within a dialog box.
small caps	Special keys on an extended keyboard, such as function keys, return, insert, etc. For example, the Insert key is shown as insert.
Note	Additional information, such as exceptions to a general rule, or more technical detail for advanced users.
Tip	Helpful suggestions and shortcuts.
Caution!	Alert you to potential loss of information.

If you don't read manuals

If you do not normally read manuals may we suggest you at least skim Introduction to **PentaCalc Pro**, Using **PentaCalc Pro**, and Creating Calculators. These three topics provide information on what makes **PentaCalc Pro** unique from a handheld calculator. We specifically recommend you also do the following:

- Learn about the Quick Copy/Paste feature in **PentaCalc Pro**. This feature will allow you to copy a number from the display in **PentaCalc Pro** and paste it into your previous application with a single keystroke. It is also possible to copy a highlighted number from any application, and paste it into **PentaCalc Pro** with a single keystroke.
- If you intend to use only a few features from several of **PentaCalc Pro**'s calculators consider building your own custom calculator by dragging and dropping the buttons you use most often onto a newly created calculator.
- If you find that **PentaCalc Pro** doesn't have a particular function you would like, consider making your own button to perform that function. See Creating Calculators for more information.
- Become familiar with the fractions capabilities and the other bases. You will probably find that you have many uses for these features. See Using **PentaCalc Pro** for more information.
- If you work with units, **PentaCalc Pro**'s Smart Units are cutting edge and introduce a whole new dimension to making calculations with units. See Unit Conversions for more information.

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System Requirements

To run **PentaCalc Pro** for Windows you will need the following:

- MS Windows Version 3.1, 95, 98, ME, 2000, XP, Vista
- Personal Computer using 80286, Pentium 4, Core 2 Duo or higher microprocessor
- Internet Access or CD / DVD Drive
- Hard disk with at least 2.5 MB (Megabyte) free space
- Mouse

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Auto Decimal
PentaCalc Pro will automatically enter the decimal place to as many decimal places as specified in the **Fixed...** item from the **Option** menu.

Discount Percentage
Computes the percentage of a number with a discount.

Subtotal
Computes and prints to the tape the current running total. Also annotates the tape with an item count.

Total
Computes and prints to the tape the current running total, clears the running total, and prints a blank line feed to the tape. Also annotates the tape with an item count.

Grand Total
Computes and prints to the tape the current grand total of all totals previously performed, and prints a blank feed line. To clear the grand total register, press **[GT]** twice or press **[AC]**.

Gross Profit Margin
Calculates the selling price and profit (or loss) amount on an item when its cost and gross profit (or loss) margin are known.

MS
Displays and prints the current value in memory, but does not clear the memory.

MT
Displays and prints the current value in memory, and then clears the memory.

M+
Adds the currently displayed value to the memory. If a multiplication or division operation is pending, pressing **[M+]** completes the operation and adds the result to memory.

M-
Subtracts the currently displayed value from memory. If a multiplication or division operation is pending, pressing **[M-]** completes the operation, and subtracts the result from memory.

Tax
Computes and prints to the tape the tax on the running total. You must then press **[+]** or **[-]** to affect the running total.

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Tax Rate
Stores the tax rate as a percentage.

Line Feed
Feeds one line to the tape. You may also select **Line Feed** from the **Edit** menu. When adding a Line Feed to the tape, you can click on the line feed space, and add a comment across the entire tape.

Manual Decimal
If Manual Decimal is selected, you must enter the decimal point manually.

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Selecting a Calculator

PentaCalc Pro consists of a multitude of different calculators which fall into two main categories:

- The default calculators that ship with **PentaCalc Pro** which have been "hard coded" and may not be modified.
- The custom calculators that you build yourself to fit your specific calculating needs. Some custom calculators shipped with **PentaCalc Pro** were built by Headgate. For example, all of the unit conversion calculators have been built by Headgate using tools provided by **PentaCalc Pro**.

You may select any calculator from the Calc menu. The **Calc** menu is divided into five different submenus: **Financial**, **Scientific**, **10-key**, **Unit Conversions** and **Misc**. It is also possible for a calculator to not be in a subgroup, but on the **Calc** menu itself.

Once you select a calculator, it will appear on the desktop available for use. It may also be attached to other calculators, or act as a template or source of buttons for other custom calculators you may want to build. **PentaCalc Pro** has two calculators that are global, meaning any time **PentaCalc Pro** is running they will be active. They are the display interface, and the standard calculator. **PentaCalc Pro** also allows one additional calculator to be active at the same time. It is possible to have several calculators displayed on your screen at the same time, but only the two global and one other calculator may be active at the same time. This way more than one calculator can have the same keyboard hot-keys and not interfere with each other. You may quickly change the active calculator by pressing the hot-key of another. Hot-keys for individual calculators are located to the right of the title on each calculator.

Accessing calculators

If you wish to use a calculator shipped with **PentaCalc Pro**, you can activate it by selecting it from the Calc menu or by pressing its hot-key. If you build your own custom calculator, **PentaCalc Pro** will automatically save and add it to the Calc menu list in the category you specify. However, you may wish to borrow custom created calculators from a friend or colleague. **PentaCalc Pro** has a method of importing a calculator and adding it to your Calc menu list.

Top

Creating a Calculator

To create a new calculator follow these steps:

1. From the **File** menu select **New Calculator...**

   The Calculator Properties dialog box will appear.

2. In the Title edit box, enter a name for the new calculator.

   This name will appear in the calculator's title bar.

3. In the Hot-key edit box, specify a hot-key which can be used to make your new calculator active when **PentaCalc Pro** is running.

   The hot-key will appear in the title bar to the right of the calculator name. You may specify a large assortment of keys for the hot-key. For example you may select any single letter, such as "g", "u", or "w". Or you may select either shift or ctrl and any other key such as shift+u or ctl+F3. **PentaCalc Pro** won't allow you to enter an invalid hot-key. It will prompt you to choose another hot-key if your entry is used by another calculator, the menus, or other Windows functions.

4. Click the preferred box to select where you want the new calculator to appear on the Calc menu. You have six choices: **Financial, Scientific, 10-key**, **Unit Conversions**, **Misc.,** and **Top Level**.

   If you choose any one of the first five choices, the new calculator will appear in the respective menu group. If you select the last choice, **Top Level**, the new calculator will appear at the bottom of the Calc menu. You may want to specify the **Top Level** for a calculator you will be using frequently; this way, you will not have to go through the extra work to find it in one of the five subgroups. Do not select the **Locked** option; this option prevents you from adding buttons to your new calculator. The **Locked** feature is explained in the Editing a Calculator's Properties topic.

5. After you have entered the name, hot-keys, and menu group, select **[OK]**.

   The new calculator will appear on your screen with the name you had specified in the Title edit box. To bring up the calculator in the future, use its hot-key, or select it from the **Calc** menu.

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Editing A Calculator

You may edit any calculator's name, hot-keys, Calc menu placement, or lock status. To change the properties of an existing calculator, follow these steps:

1. Make sure the calculator you wish to edit is active by clicking on its title bar using it's hot-key, or selecting it from the Calc menu. (You can tell a calculator is active when its title bar is highlighted.)
2. From the **File** menu, select **Calculator Properties...**

   The Calculator Properties dialog box will appear. Here you may edit any property. A complete explanation of this dialog box, except the Locked feature, is provided in the Creating a Calculator topic. You may select Locked to make it impossible to inadvertently change buttons on the calculator. If Locked is checked, you cannot move buttons on or off the calculator, or change any of the button properties. You may, however, change the contents (anything stored in a number button) of a button. For example, you can continue to store numbers in memory buttons.
3. After making the desired changes, select **[OK]**.

Top

Deleting a Calculator

It is possible to delete any calculator by following these steps:

1. Make sure the calculator you wish to delete has is active by clicking on the title bar.
2. Delete all buttons from the calculator. For more information on deleting buttons see the Deleting Buttons topic.
3. Select **Delete Calculator** from the **Edit** menu.

   The selected calculator will be deleted.

See Also: Creating a Calculator

Top

Deleting a Button

You may delete a button by following these steps:

1. Using your right mouse button, click on the button you want to delete.
2. Press the delete key on your computer keyboard .

   -or-

   Select **Delete Button** from the **Edit** menu.

See Also: Creating a Button

Top

Using Number Buttons

Using **PentaCalc Pro**, you have the ability to create unlimited number buttons, which you may use as storage or constant buttons. Number buttons are generally used to temporarily store numbers. They may be left blank or given a name, such as Mem 1, Mem 2, etc. A constant button generally stores a number that is infrequently changed. An example may be Pi or Avogadro's number.

A number button behaves on the tape as a variable if it is given a name. For example, if you create a button and call it "Mem1", each time you press **[Mem1],** Mem 1 will appear on the tape but the number stored in [Mem1] will be used in the calculation. Thus, if you recalculate the tape and have 3 stored in [Mem1], then 3 will be used in the calculation for **[Mem1]**. If you then store 5 in **[Mem1]**, 5 will be used in the recalculation of the tape.

Creating storage and constant buttons

To create and use a storage or constant button follow these steps:

1. From the **File** menu select **New Button....**

   The Button Properties dialog box will appear.

2. In the Title edit box, enter the name of the button.

   If you leave the Title edit box blank the number stored in the button becomes the name of the button.

3. In the Hot-key edit box enter a hot-key.

   The Hot-key field allows you to create a keyboard accelerator for the newly created button. If it is left blank, **PentaCalc Pro** will attempt to assign a hot-key for you.

4. Using your mouse, click on the box to the left of **Number**.

   This will indicate to **PentaCalc Pro** that you want to create a number button.

5. Select **[OK]**.

   The cursor will become the outline of a button.

6. Use the cursor to position the button where you would like it on a calculator and click the left mouse button.

   The button will be a part of the calculator.

7. Once you have created the new button enter in the display, the number you wish to store.

8. Press the newly created button.

   This will store the number "in" the button.

9. To recall your stored number for use in a calculation, press the newly created button.

The number will appear if you did not give the button a name. If the button has a name, press **[Rcl]** followed by the button and the actual number will appear.

Practicing with number buttons

Example: Calculate the number of days between today and Christmas.

Part 1: Create a button with today's date.
You will need to create room for your new buttons. You may either create a new calculator or extend the sides of an existing calculator. In the example below, we extended the bottom of the standard calculator.

1. Create a new number button and enter "Today" for the title.

2. From the **Option** menu, select **Dates**.

   [.] will change to **[/]** on the standard calculator.

3. Enter todays date. (if today were July 17, 1994 enter 7 **[/]** 17 **[/]** 94).
4. Select **[Today]**. This will store the date you entered in [Today].

   -or-

   Press the **[Date]** button on the standard calculator and the date will be printed on the tape from your computer's system clock.

Part 2: Create a button with the date of Christmas.

1. Follow the Creating a Button section and enter "Christmas" for the title.
2. Enter 12 **[/]** 25 **[/]** 94 (or the current year).
3. Select **[Christmas]**. This will store 12/25/1994 (or the date you entered) in [Christmas].

Part 3: Calculate the number of days between today and Christmas.

Enter	**Display**
[Christmas] [-]	**Christmas**
[Today] [=] -or- **[Date] [=]**	**161**

Top

Creating a Graph

Once you have generated a graph with **PentaCalc Pro**, it is possible to resize and scale it to gain information about its maxima or minima. **[Graph]** is located on the standard calculator.

To create a graph of an expression you must:

1. Start the expression with **[{ }]**.
2. Enter the expression the same way you would calculate it and substitute a dummy variable in the place of a value.

   The dummy variable is represented on the x-axis and the result of the expression is represented on the y-axis.

   You may create a new number button to serve as the dummy variable if it has a name. For example you could create a new number button and name it "X".

   -OR-

   You may use a memory button from the standard calculator as a variable such as: **[M1]**, **[M2]** or **[M3]**.
3. End the expression with **[{ }].**
4. Press **[Graph]** on the standard calculator.

   PentaCalc Pro will look up the tape from the current insertion point until it finds the first expression contained within two curly brackets and will graph that expression.

Example: Graph the expression "sin x + 4."

Solution: Select Radians from the Option menu. If you plot the function in degrees it will come out rather flat. Use **[{ }]** to signify the start of the expression and **[{ }]** to signify the end. We will use [M1] from the standard calculator for our dummy variable.

Enter	Display
[{ }] [M1] [sin] [+] 4 **[=] [{_}] [Graph]**	**{** **M1Sin** **+** **4.00=** **}** **Graph**

A window with a graph of the expression will appear.

See Also: Graphing Calculator, Modifying a Graph, Viewing a Graph

Top

Modifying a Graph

You may edit a function and regraph at any time. Once a graph is plotted, the function will remain on the tape between curly brackets ({ }). You may modify any part of the function and the graph will automatically change.

Example: Graphing and editing a function.

Part 1: Graph the function: z½ - 14z¼ + 63z» - 106z + 56 = 0

Solution: In this example we created a new number button called "z" and placed it at the bottom of the standard calculator. You may substitute [M1] for "z" if you desire.

Enter	**Display**
[{_}] [z] [y•] 4 [-] 14 **[x] [z] [y•]** 3 **[+]** 63 **[x]**	**63**
[z] [x»] [-] 106 **[x] [z] [+]** 56 **[=] [{_}] [Graph]**	**56**

Part 2: Graph the equation above with each z coefficient divided by four.

The new equation is: 0.25z½ - 3.5z¼ + 15.75z» - 26.5z + 14 = 0

Solution: You may graph this new equation one of two ways.:

- Enter the new expression.

  -OR-

- Edit the tape from Part 1 of this example by highlighting and changing the coefficient for each z variable.

If you chose to modify the existing expression, you should first highlight and delete the entire last line which has the graph operator. This will prevent **PentaCalc Pro** from executing the graph command and regenerating the graph after you change each coefficient. If you decide to edit the tape follow these steps:

1. You may add the .25 coefficient at the top of the tape by setting the insertion point below the left curly bracket and entering .25 **[x]**.
2. Press **Enter**.
3. Edit each coefficient using standard Windows editing functions.
4. Return the insertion point to the bottom of the tape by selecting Restore Insertion Point from the Edit menu.
5. Press **[Graph]**.

The graph will appear.

See Also: Graphing Calculator, Creating a Graph, Viewing a Graph

Top

Printing a Graph

You may print a graph at any time by following these steps:

1. Click **[Print]** on the graph window.

   The "Select Printer" dialog box appears showing a combo box with the default printer selected.
2. To print to a printer other than the one currently displayed, select the drop down button, and then the new printer.
3. To change various configurations on the current printer (such as the number of copies and/or layout format), select **[Setup]**.
4. When you have selected the printer and setup, select **[OK]**.

See Also: Graphing Calculator, Creating a Graph, Viewing a Graph

Top

Copying a Graph

PentaCalc Pro allows you to copy the graph as a bitmap image to the clipboard, and paste it into any application that supports bitmap images.

To copy a graph, do the following:

1. Generate a graph.
2. Select **[Copy]** on the graph interface.

   The graph will be copied to the clipboard.
3. Open your target application.
4. Select **Paste** from the **Edit** menu on your target application.

   The graph will be pasted in your application.

See Also: Graphing Calculator, Creating a Graph

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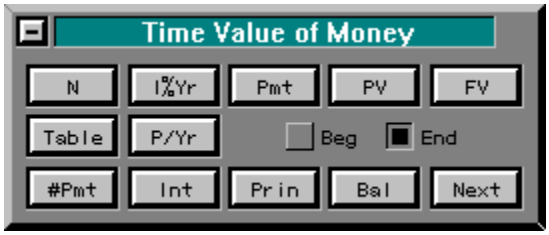
Time Value of Money Calculator

Click on the part of the calculator where the appears for a brief description or select a topic below the calculator for detailed information.



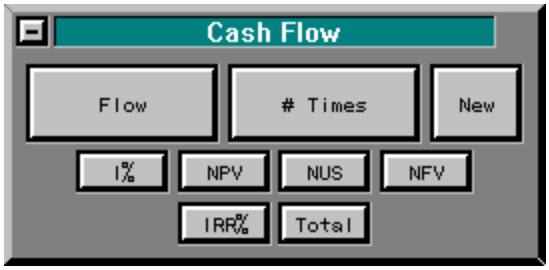
- Overview
- When to Use Time Value of Money
- Basic Calculations
- Amortizations

See Also: Cash Flow, Depreciation, Business, Bonds

Top

Cash Flow Calculator

Click on the part of the calculator where the appears for a brief description or select a topic below the calculator for detailed information.

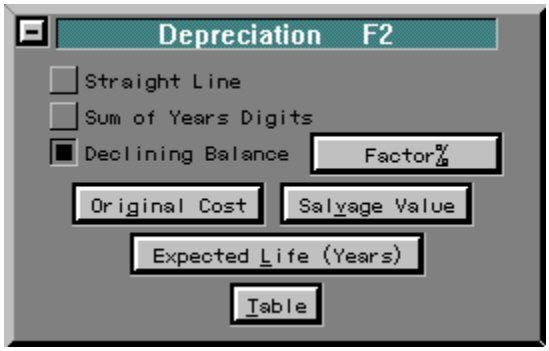


- When to Use the Cash Flow Calculator
- Cash Flow Signs and Numbers
- Entering Cash Flows
- Viewing and Editing Cash Flows
- Cash Flow Calculations

Top

Depreciation Calculator

Click on a button for a brief description or select a topic below for detailed information



- Calculating Depreciation

Top

Business Calculator

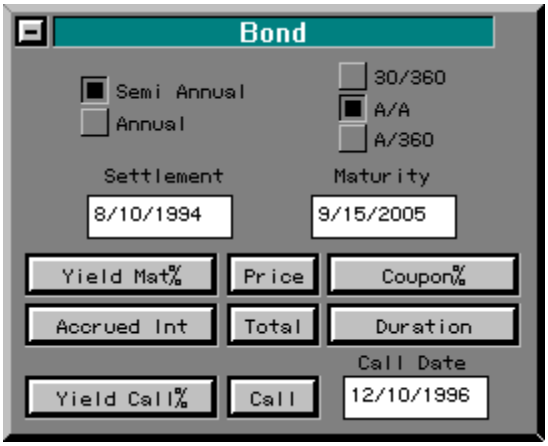
Click on the part of the calculator where the appears for a brief description or select a topic below the calculator for detailed information.

- Calculating Percentages
- Interest Rate Conversions

Top

Bonds and Notes

To make bond calculations, you may input the settlement (purchase) date, maturity date, and call date in the field directly below the respective label. Select the coupon payments and calendar basis by checking the appropriate radio box. Click on the part of the calculator where the appears for a brief description or select a topic below the calculator for detailed information.



- Overview
- Anatomy of a Bond
- Notes
- Bond Calculations

Top

Complex numbers

Complex numbers are ordered pairs of numbers which are represented by two real numbers enclosed within parentheses. The complex numbers are separated by the non-radix character. The radix in the United States is usually represented by a period; therefore, we will represent the non-radix character with a comma. For example, an acceptable number is (2.341, 7.814). If you are not familiar with complex numbers, you may want to think of them as two-dimensional vectors or point coordinates.

Most of **PentaCalc Pro**'s complex number functions compute results that are meaningful in ordinary two-dimensional geometry, as well as for complex numbers. However, **PentaCalc Pro** has some limitations. You cannot assign units to or use fractions with complex numbers. The complex number (x,y) as entered in **PentaCalc Pro** can have one of four different meanings.

- A complex number z in rectangular notation, where x is the real part of z, and y is the imaginary part.
- A complex number z in polar notation, where x is the real part of z, and y is the polar angle.
- The coordinates of a point in two dimensions, in rectangular coordinates, where x is the abscissa or horizontal coordinate, and y is the ordinate or vertical coordinate.
- The coordinates of a point in two dimensions, in polar coordinates, where x is the radial coordinate, and y is the polar angle.

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Logarithmic, Exponential, and Hyperbolic Functions

PentaCalc Pro contains both common and natural logarithmic and exponential functions, and hyperbolic functions and their inverses. The buttons **[e•]** and **[Ln]** compute exponentials and logarithms to base e. (e is a transcendental number approximately equal to 2.71828182846.) The buttons **[10•]** and **[Log]** compute exponentials and logarithms to base 10. Hyperbolic functions are certain combinations of exponential functions, with properties similar to those of the trigonometric functions. They are useful for solving differential equations and evaluating integrals, and have other uses in mathematics and physics.

Calculating logarithmic and exponential functions

Example: Compute the common logarithm of 45.

Enter	Display	Description
45 **[Log]**	1.65	calculates log of 45

Example: Compute the antilogarithm of 2.34.

Enter	Display	Description
2.34 **[10•]**	218.78	calculates antilog of 2.34

Example: Compute the natural log of 29.46.

Enter	Display	Description
29.46 **[Ln]**	3.38	calculates natural log of 29.46

Example: Compute e5.

Enter	Display	Description
5 **[e•]**	148.41	calculates e to the 5th power

Example: Compute 43.

Enter	Display	Description
4 **[y•]**	4	enters the base number
3 **[=]**	64	computes the cube

Example: Compute .

Enter	Display	Description
298 **[†…]**	298	enters the radical
7 **[=]**	2.25	computes 7th root of 298

Calculating Hyperbolic functions

The following examples are calculated to 4 decimal places.

Example: Compute the hyperbolic tangent of .5.

Enter	Display	Description
.5 **[Tanh]**	.4621	calculates Tanh

Example: Compute the inverse hyperbolic cosine of 4,000.

Enter	Display	Description
4,000 **[Cosh€]**	8.9872	calculates inverse Cosh

Top

Number Of Payments
Stores the number of payments to be amortized and calculates the amortization schedule.

Nominal Annual Interest Rate
Stores or calculates the nominal annual interest rate as a percentage. Nominal interest rate is an annual rate that is compounded periodically. Be sure to enter a percentage as 8.25% not .0825.

Payment Amount
Stores or calculates the amount of each periodic payment. The payments are the same amount, and no payments are skipped. Payments can occur at the beginning or end of each period.

Present Value
Stores or calculates the present value of the series of future cash flows. To the lender or borrower, PV is the amount of the loan. To an investor, PV is the initial investment. PV always occurs at the beginning of the first period.

Future Value
Stores or calculates the future value-the amount of the final cash flow, or the compounded value of the series of previous cash flows. Future Value always occurs at the end of the last period.

Table
Creates an amortization table.

Payments Per Year
Stores the number of payments or compounding periods per year. The value must be an integer between 1 and 999. The default is 12.

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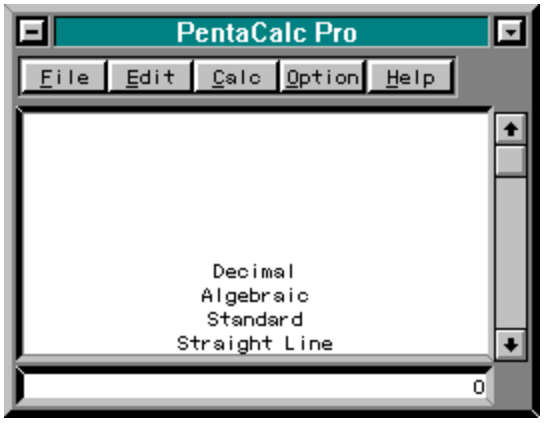
Tape Display Overview

Click on the part of the calculator where the appears for a brief description or select a topic below the calculator for detailed information.



- About the Tape Display
- Creating a New Tape
- Saving the Tape
- Opening the Tape
- Printing the Tape
- Resizing the Interface
- Using the tape display
- Entering Numbers
- Editing Numbers
- Adding Memos to Numerical Entries
- Editing Memos
- Using and Editing the Operator Field
- Changing the Insertion Point

Top

Entry Notations

PentaCalc Pro has three different entry notations:

Algebraic	The most common notation found on handheld calculators and **PentaCalc Pro**'s default.
RPN	Reverse Polish Notation is a popular entry notation on Hewlett-Packard handheld calculators.
10-key	Emulates the desktop tape adding machines you may be used to.

Top

Common Operations

Click on one of the topics below:

- Using the Keyboard
- Changing the Decimal Point
- Doing Arithmetic
- Clipboard Support
- Fractions

Top

Base Conversions

PentaCalc Pro provides the ability to operate in one of seven bases. You can use the time bases to calculate days between dates or what day of the week a particular day falls on in the future. In fact, you can even calculate the standard deviation of a list of binary numbers.

Converting numbers between the different bases is very easy:

1. Select the desired base from the **Option** menu.
2. Enter numbers and perform operations.
3. Change to a new base by selecting it from the **Option** menu and the number in the display will be converted.

Select one of the following topics for more information about each base:

- Time Bases
- Feet / Inches Bases
- Other Bases

See also: Unit Conversions, Using HMS in Angle Calculations.

Top

Total Number Of Payments
Stores or calculates the total number of payments (or compounding periods). N can be expressed in any unit of time, such as years, months, or days.

Interest
Displays the amount of the payments applied toward interest.

Principle
Displays the amount of payments applied toward principle.

Balance
Displays the balance of the loan.

Next Set Of Payments
Calculates the amortization schedule for the next set of payments using the stored value of [#Pmt].

Begin or End
Radio buttons used to determine if payments occur at the beginning or ending of each period.

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Menu Items

File
- New Tape
- Open Tape
- Save Tape
- Save Tape As...
- Print Tape
- New Calculator
- New Button
- Import Calculator
- Calculator Properties
- Button Properties

Edit
- Copy
- Paste
- Delete
- Delete Button
- Delete Calculator
- Set Insertion Point
- Restore Insertion Point
- Line Feed

Calc
- Financial
- Scientific
- 10-Key
- Unit Conversions
- Miscellaneous
- Standard

Option
- Configure
- The following simply set the calculator to the named mode:
  - Degrees
  - Radians
  - Grads
  - Standard
  - Fixed
  - Scientific
  - Engineering
  - Decimal
  - Binary
  - Octal
  - Hexadecimal
- Hours-Minutes-Seconds
- Dates
- Feet-Inches
- Algebraic
- 10-key Notation
- RPN

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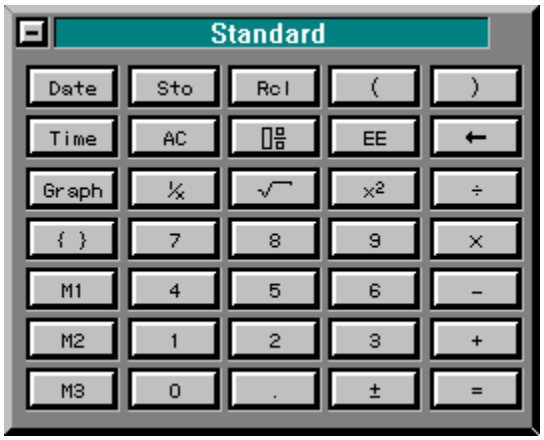
PentaCalc Contents

- Introduction to PentaCalc
- Using **PentaCalc Pro**
- Creating Custom Calculators
- Graphing Calculator
- Financial Calculator
- 10-key Calculator
- Scientific Calculator
- Unit Conversions Calculator
- Programming Calculator
- Statistics Calculator
- Menu Items
- Overview of Calculators

Top

Standard Calculator

The standard calculator is a multi-purpose calculator. The one shown below is only one of many looks the
standard calculator may have. For instance, when you switch to Hexadecimal, the decimal buttons 0-9 change to hexadecimal buttons 0-F. Other buttons on the the calculator will change as well when switching to other modes and bases.



See Also: Feet / Inches Base, Time Bases, Other Bases, RPN, Algebraic.

Top

Time Value of Money Overview

The time value of money (TVM) calculator bases its computations on compound interest, taking into account that interest, added to the principal at specific compounding periods, also earns interest. Many TVM problems are compound interest calculations, such as:

- Savings accounts
- Mortgages
- Pension funds
- Leases
- Retirement accounts
- Annuities

Amortization calculations determine the amounts applied toward principal and interest in a payment or series of payments.

Top

When to Use Time Value of Money

TVM is used specifically when there is a series of cash flows and one of the following situations occurs:

- The dollar amount is the same for each payment. (When the cash flow varies, use **PentaCalc Pro**'s cash flow calculator.)
- The payments are at regular intervals.
- Payment periods coincide with the compounding periods.

See Also: Cash Flows and Signs of Numbers

Top

Basic TVM Calculations

The following general instructions explain how to perform TVM calculations.

1. Click **[AC]**.

   [AC] will clear the entry display as well as all TVM registers.

2. Enter the payments per year for your current calculation and select **[P/Yr]**.

   If you do not enter a new number, the TVM calculator will default to the previous setting. **PentaCalc Pro** ships with **[P/Yr]** at 12.

3. Select **Beg** or **End** mode to specify if payments occur at the beginning or end of the period.

4. To store the values you know, enter the number and click the appropriate button. It is important to keep in mind the "direction" of cash flows and assign the proper sign to them. For example, you may want to mark any outgoing money with a negative sign, and designate any incoming money as positive.

5. To calculate a value, click on the button of the unknown value.

The following examples show various TVM calculations. Unless otherwise specified, please keep **PentaCalc Pro** in **End** mode while performing the following calculations.

Example 1: Home Mortgage

Part 1: Suppose you are buying a home for $100,000 with $5,000 down. You need a loan for $95,000 over a 30 year amortization period, compounded monthly at 8.5%. What will your monthly payment be?

Solution: Part 1. First, from the Calc menu select **Time Value of Money** from the **Financial** subgroup. Make sure you select **[AC]** to clear all values in the TVM registers.

Enter	Display	Description
12 [P/Yr]	**12.00P/Yr**	change to 12 payments per year
12 [X] 30 [=]	**360.00**	number of months in 30 years
[Sto] [N]	**360.00N**	enters 360 months
8.5 [I%Yr]	**8.50I%Yr**	enters interest rate
95000 [PV]	**95,000.00Pv**	enters loan amount
[Pmt]	**-730.47**	displays payment amount

Part 2: You decide you can only afford a payment of $700.00. What will the interest rate need to be to give you this new payment?

Solution: Part 2.

Enter	Display	Description
700 **[±] [Pmt]**	**-700.00Pmt**	enters new payment
[I%Yr]	**8.04**	shows new interest rate

Example 2: Car Loan

Part 1: Your current car has decided that a new car is in your near future. After a careful examination of your budget, you have decided you cannot afford a down payment; however, you can afford a monthly payment of $289.00. The current interest rate on a "nothing down, drive it off the lot today" deal is 10.5% over 5 years. How much can you afford for a new car?

Solution: Part 1. First, from the Calc menu select Time Value of Money from the Financial subgroup. Make sure you select [AC] to clear all values in the TVM registers. If necessary, enter 12 and select

[P/Yr] to change to 12 payments per year.

Enter	Display	Description
12 **[X]** 5 **[=]**	**60.00**	**number of months in 5 years**
[Sto] [N]	**60.00N**	enters 60 months
10.5 **[I%Yr]**	**10.50I%Yr**	stores the interest rate
289 **[±] [Pmt]**	**-289.00Pmt**	stores your maximum payment
[PV]	**13445.68PV**	maximum amount you can afford

Part 2: After shopping around, you find a "killer deal," with an interest rate of 4.5% and nothing down. However, you need to pay off the loan in 3 years instead of 5. If you take this offer, how much can you afford?

Solution: Part 2.

Enter	Display	Description
[AC]	**0.00**	clears the display
3 **[x]** 12 **[=]**	**36.00**	number of months in 3 years
[Sto] [N]	**36.00N**	enters the number of periods
4.5 **[I%Yr]**	**4.5I%Yr**	enters new interest rate
289 **[±] [Pmt]**	**-289.00Pmt**	stores your maximum payment
[PV]	**9715.29**	maximum amount you can afford

Part 3: After looking around the car lot, you find a great car for $7,500 with an interest rate of 4.5% over 3 years. What is your monthly payment?

Enter	Display	Description
[AC]	**0.00**	clears the display
3 **[x]** 12 **[=]**	**36.00**	number of months in 3 years
[Sto] [N]	**36.00N**	enters the number of periods
4.5 **[I%Yr]**	**4.5I%Yr**	enters new interest rate
7500 **[PV]**	**7500.00PV**	maximum amount you can afford
[Pmt]	**9715.29PMT**	your monthly payment

Example 3: IRA Investment

Note: This problem is designed to be solved consecutively through each of the four parts. Please do not select [AC] between parts.

Part 1: You have just turned 30 and decide it is time to start thinking about retirement. You want to calculate what your IRA will be worth in 30 years when you turn age 60. You plan to invest $2,000 per year in the account, and expect to earn 12.5% on your money.

Solution: Part 1. First, from the Calc, menu select Time Value of Money from the Financial subgroup. *Make sure you select [AC] to clear all values in the TVM registers*

Enter	Display	Description
Beg	**0.00**	changes to Beg mode
1 [P/Yr]	**1P/Yr**	changes to one payment per year
30 **[N]**	**30.00N**	enters the number of periods
12.5 **[I%Yr]**	**12.5I%Yr**	enters interest rate
2000 **[±][PV]**	**-2,000.00PMT**	enters IRA contribution
[FV]	**598,379.49PMT**	value of IRA at age 60

Part 2: In addition to making your yearly IRA investments, you will be rolling over $7,354 from your 401k plan from a previous employer. With the 401k rollover, what will your retirement savings be worth

in 30 years?

Solution: Part 2. Since all cash outflows are negative, you will enter the $7,354 from your 401k plan as a negative value in the present value button.

Enter	Display	Description
7354 **[±] [PV]**	**-7.354PV**	enters value of 401k rollover
[FV]	**850,204.75**	retirement value at age 60

Part 3: You decide you want to have one million dollars in the account when you turn age sixty. At what interest rate will you need to invest your IRA at to reach this goal?

Solution: Part 3. Since all cash inflows are positive, you will enter the $1,000,000 you expect to receive as a positive value in [FV].

Enter	Display	Description
1000000	**1,000,000FV**	retirement value at age 60
[I%Yr]	**13.23**	interest rate needed to reach goal

Part 4: You reach age sixty and believe you will live another 25 years. You want to die broke. You have also moved your IRA into lower risk investments and are now earning 8% per year. You want to know how much you can take out each month for the next 25 years.

Solution: Part 4. Since all cash outflows are negative, you will enter the $1,000,000 total from your retirement savings as a negative value in the present value button. You will press [Pmt] to find out how much monthly spending money you will have.

Enter	Display	Description
8 **[I%Yr]**	**8.00I%**	enters interest rate
12 **[P/Yr]**	**12.00P/Yr**	enters new payment/yr
12 **[x]** 25 **[=]**	**300.00**	number of months left
[Sto] [N]	**300.00N**	enters months
1000000 **[±] [PV]**	**-1,000,000.00PV**	enters PV
0 **[FV]**	**0.00FV**	amount to die with
[PMT]	**7,667.05**	monthly money

If you press **[Table]**, an annuity table will appear, showing how much of your monthly spending money is coming from principal, and how much is coming from interest.

See Also: TVM Overview, TVM Calculator

Old
Stores or calculates the old number.

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Amortizations

The amortization portion of TVM is used to calculate the following values for a single loan payment or series of loan payments:

- The balance of the loan after the payment(s) are made.
- The amount of the payment(s) applied toward interest.
- The amount of the payment(s) applied toward principal.

Calculating an amortization table

You may need to calculate an amortization table for your house or car. You may perform these calculations by following these steps:

1. Select **[AC]** to clear the TVM variables.
2. If necessary, change the number of payments per year by entering a value and selecting **[P/Yr]**.
3. Enter the annual interest rate and select **[I%Yr]**.
4. Enter the amount of the loan (the principal) and select **[PV]**.
5. Enter the amount of the periodic payments (make sure to change the sign if necessary) and select **[Pmt]**.
6. Enter the number of payments to be amortized and select **[#Pmt]**.
7. To display the amount applied toward principal, select **[Prin]**.
8. Select **[Bal]** or **[Int]** to display the loan balance or interest paid.
9. To continue calculating the schedule for subsequent payments, do one of the following:

   a. Enter the number of succeeding payments to be amortized and select **[#Pmt]**.

   -OR-

   b. Select **[Next]** to use the previously stored value for **[#Pmt]**.

10. Select one or all of the **[Bal]**, **[Int]**, and **[Prin]** keys to see the balance, interest, and principal for this period.

Example: Amortization schedule for a home mortgage.

You have just purchased a home and have a 30 year mortgage at 9.5%, with a loan balance of $75,000. You want to know how much of the loan you will pay during the first two years of the loan. You also would like to generate an amortization table for the mortgage.

Solution: First, from the Calc menu select Time Value of Money from the Financial subgroup. Make sure you select [AC] to clear all values in the TVM registers. If necessary, enter 12 and select [P/Yr] to change to 12 payments per year. *You will also want to be sure End mode is checked*.

Enter	Display	Description
12 **[˜]** 30 **[=]**	**360**	total months in 30 years
[N]	**360N**	enters total months
9.5 **[I%Yr]**	**9.5I%**	stores interest rate
75000 **[PV]**	**75,000PV**	stores amount of loan
[Pmt]	**-630.64Pmt**	payment amount
12 **[#Pmt]**	**12#Pmt**	displays payments
[Int]	**-7105.21Int**	1st year's interest

[Prin]	**-462.48Print**	1st year's principal
[Bal]	**74537.52Bal**	balance after 1st year
[Next]	**13-24#Pmt**	displays payments
[Int]	**-7059.31Int**	2nd year's interest
[Prin]	**-508.38Prin**	2nd year's principal
[Bal]	**74029.14Bal**	balance after 2nd year

To generate an amortization table for this example, select **[Table].** An amortization table will appear on the tape. You may print the amortization table directly from **PentaCalc Pro**, or copy part or all of it to another application via the clipboard for further editing or printing.

See Also: TVM Calculator

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When to Use the Cash Flow Calculator

Use the cash flow calculator when you need to calculate the following:

- The internal rate of return (IRR%) of the cash flows.
- The net present value (NPV), net uniform series (NUS), and net future value (NFV) for a specified interest rate.

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Cash Flow Signs and Numbers

In cash flow calculations, money received is a positive number, and money paid out is a negative number. The sign used on a particular cash flow depends on your point of view. A loan is an initial positive cash flow for the borrower, and initial negative cash flow for the lender.

Situations where there are no consecutive, equal cash flows, are called *simple cash flows*. An example of a simple cash flow would be $400, $800 and $250 in three consecutive periods. Consecutive, equal cash flows are called *grouped cash flows*. An example of a grouped cash flow would be if you had a $700.00 cash flow per period two or more periods.

See Also: Cash Flow Calculator, Cash Flow Calculations, Entering Cash Flow

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Entering Cash Flows

To enter cash flows on the tape:

1. Select **Cash Flow** from the **Financial** subgroup on the **Calc** menu.
2. Make sure your cash flows are occurring at regular intervals, and at the end of each period. If one or more periods are skipped, set their flows equal to 0. If consecutive, equal cash flows occur, you can group them to make entering data easier.
3. Enter the value of the initial cash flow and press **[Flow]**.

   Remember to use **[±]** if necessary to change the sign on the initial cash flow.
4. Enter the first cash flow and press **[Flow]**.

   If the flow occurs only one time, go directly to step 6.
5. Enter the number of consecutive occurrences for flow 1 and press **[# Times]**.
6. Enter the second cash flow, and press **[Flow]**. You may then continue to enter flow values. When you have entered all the flows, you may perform calculations on the list at any time.

See Also: Cash Flow Calculator, Cash Flow Calculations

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Viewing and Editing Cash Flows

Editing a number or flow

All cash flow numbers are stored in a list on the tape. You may edit individual numbers by using standard Windows editing conventions of highlighting, modifying, or deleting text. Once you have made your desired changes, press enter on your keyboard and **PentaCalc Pro** will calculate the changes.

Inserting a cash flow

1. To insert a cash flow, select **Set Insertion Point** from the **Edit** menu.

2. Use the cursor to click between two cash flows where you would like the new cash flow to occur.

-OR-

You may set the insertion point by clicking on the right mouse button with the cursor on the line where you would like the new insertion point to appear below.

3. Once the new insertion point is set, you may enter the new cash flow.

4. To return the insertion point to the bottom of the tape, select **Restore Insertion Point** from the **Edit** menu

-OR-

Right click the mouse on the bottom entry of the tape.

Deleting a cash flow

You may delete a cash flow by using the cursor to highlight the entire cash flow line, and pressing delete on your keyboard.

-OR-

You may select **Delete** from the **Edit** menu.

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Flow
Enters the initial cash flow, and subsequently is used to enter the current cash flow.

Number of Times
Enters the numbers of times for the current cash flow.

New
Starts a new cash flow table.

Periodic Interest Rate
Stores the periodic interest rate expressed as a percentage (sometimes called the discount rate, cost of capital, or required rate of return).

Net Present Value
Calculates the net present value (the present value of a series of cash flows plus the initial cost of the investment computed for a specific periodic interest rate).

Net Uniform Series
Calculates the net uniform series (the dollar amount of regular, equal cash flows having a present value equivalent to the net present value).

Net Future Value
Calculates the net future value of a series of cash flows by finding the future value of the net present value.

Internal Rate of Return
Calculates the internal rate of return (the interest or discount rate at which the net present value of the cash flows equals 0). For conventional investments, the investment is attractive if the IRR% is greater than the cost of capital.

Total of Cash Flows
Calculates the sum of the cash flows.

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Cash Flow Calculations

It is possible to have more than one cash flow table on the tape at any time, but calculations are done on the most recent table. You may perform calculations on any cash flow table by setting the insertion point below the table you wish to perform calculations on. In addition, the insertion point doesn't need to be exactly after the most recent table. Once a cash flow list has been entered, there are several different calculations that you can perform on the list.

To calculate:

The sum of the cash flows, select **[Total]**. This will sum the entire cash flow list.

The internal rate of return (IRR%), select **[IRR%]**. This function calculates the periodic interest rate(s), which gives a net present value of zero for the cash flow

Note that **PentaCalc Pro** only calculates a periodic rate of return. To calculate the annual rate of return, multiply the periodic rate by the number of periods per year. **PentaCalc Pro** may generate more than one solution with this method if you have more than one sign change. In fact, the number of possible solutions is equal to the number of sign changes in the list of cash flows.

The *net present value* (NPV), *net uniform series* (NUS), and/or *net future value* (NFV), follow these steps:

1. Enter the periodic interest rate as a percentage, and select **[I%]**.
2. Select either **[NPV]**, **[NUS]**, or **[NFV]** to obtain the respective answer. The net present value is the present value of all future cash flows discounted at the cost of capital (I%). The net uniform series is the dollar amount of regular, equal cash flows which equal the net present value. The net future value is the future value of the net present value at I%.

Example: Calculate the IRR%, NPV, NUS, and NPV of a "Cash Cow".

Your good friend approaches you about funding his latest "Cash Cow" investment scheme. This investment involves some great "retirement land" (with lots of water for golf courses and duck ponds) in Florida. He is asking for an initial investment of $250,000. (Your current nest egg is held in high grade government and corporate bonds, earning 8% a year.) He "promises" to pay you nothing at the end of the first year, $30,000 at the end of the 2nd, 3rd, and 4th years, and the big payoff of $400,000 at the end of the 5th year when phase five is completed and the last retirement unit is sold. You consider this a somewhat risky proposition and require at least a 20% per year return on your investment to do this kind of deal. Do you take your friend up on the investment?

Enter	**Display**		
	Flow#	**Amount**	**#Times**
250000 **[±] [Flow]**	**Initial flow**	**-250,000.00**	**1.0**
0 **[Flow]**	**1**	**0.00**	**1.00**
30000 **[Flow]**			
3 [# Times]	**2**	**30,000**	**3.00**
400000 **[Flow]**	**3**	**400,000**	**1.00**
20 **[I%]**		**20.00**	**I%**
[NPV]		**-36,586.93**	**NPV**
[NUS]		**-12,233.93**	**NUS**
[NFV]		**-91,040.00**	**NFV**
[IRR%]		**15.85**	**IRR%**

Based on the above calculations, your good friend will need to find someone else to invest in his cash cow because you were not able to meet your investment objectives for this type of investment.

See Also: Cash Flow Calculator, Entering Cash Flow. Top

Calculating Percentages (Business)

You may use **PentaCalc Pro** for various business percentage problems. Each percentage problem consists of three variables. If you know any two variables, you may solve for the third. Once you have selected the business calculator, store the known values by keying in the number and pressing the appropriate button. Once you have entered two variables, press the third button and the answer will appear in the display

Markup on Cost

Example: The Flower Stand.

You have decided to open a flower stand during the peak flower buying season. You would like to markup the flowers 80%. You buy roses for $.25 each. What should be your selling price marked up as a percentage of cost? You must first select the **%Cst** option on the business calculator.

Enter	Display
.25 **[Cost]**	**0.25Cost**
80 **[Mar%]**	**80.00Mar%**
[Sell]	**Sell**
	0.45

Markup on Price

Example: The Pet Rock is back.

It is time to revive the pet rock. You are confident you can sell a Pet Rock for $12.99, and you have a friend with a warehouse full of them. He will sell them to you for $1.99 each. What is your markup as a percent of the selling price? You must first select the **%Sel** button on the business calculator.

Enter	Display
1.99 **[Cost]**	**1.99Cost**
12.99 **[Sell]**	**12.99Sell**
[Mar%]	**Mar%**
	84.68

Percent change

Example: Real estate is on the rise.

Last year you had your house appraised at $127,000; this year, it was appraised at $184,000. What is the percent change between the two years?

Enter	Display
127000 **[Old]**	**127,000.00Old**
184000 **[New]**	**184,000.00New**
[%Chg]	**%Chg**
	44.88

Percent of Total

Example: Spring has sprung.

It is time to spray fertilizer on your lawn. The fertilizer manufacturer suggests you prepare a mixture that is 22% fertilizer concentrate of the total mixture. You want to prepare 5 gallons of the mixture. How many gallons of concentrate do you need?

Enter	Display
22 **[% Total]**	**22.00%Total**
5 **[Total]**	**5.00Total**
[Part]	**Part**

See Also: Business Calculator Top

Calculating Depreciation

To calculate the depreciation for an asset:

1. From the **Calc** menu select **Depreciation** from the **Financial** subgroup.
2. Enter the depreciable-cost basis of the asset at time of purchase, and press **[Original Cost]**.
3. Forecast the salvage value, and store it in **[Salvage Value].**
4. Store the expected life of the asset in **[Expected Life (Years)]**.

   This entry must be in years.
5. Select either **Straight Line**, **Sum of Years Digits**, or **Declining Balance** methods.

   If you select **Declining Balance** you will also need to enter the factor percentage in **[Factor%]**. **[Factor%]** will automatically appear once **Declining Balance** is selected.
6. Select **[Table]**, and a depreciation table for the asset will appear on the tape. The depreciation table is divided into three columns labeled P.D.A., A.D.A., and A.B.V. which stand for Periodic Depreciation Amount, Accumulated Depreciation Amount, and Asset Book Value respectively.
7. If you desire to calculate a depreciation table using another method for the same asset, select the new depreciation method and select **[Table].**

Example: The boss goes fishing.

Your company has just purchased a single engine turboprop amphibious floatplane to serve as a company shuttle between two plants, and as an executive transport (the boss mentioned something about some good fishin' holes in Alaska, this is where the floats come in handy). The initial purchase price is $1,233,000, which is to be depreciated over 14 years. Its salvage value is estimated to be $635,000.

Generate depreciation tables for the aircraft using Straight Line, Sum of the Years Digits, and Declining Balance methods. Use 200% of the Straight Line depreciation for the Declining Balance calculation.

Enter	Display	
1233000 **[Original Cost]**	**1,233,000.00**	**Original Cost**
14 **[Expected Life (Years)]**	**14.00**	**Expected Life (Years)**
635000 **[Salvage Value]**	**635,000.00**	**Salvage Value**
Declining Balance (button)		**Declining Balance**
200 **[Factor%]**	**200.00**	**Factor%**
[Table]		**The table appears**
Straight Line **[Table]**		**The table appears**
Sum of Years Digits **[Table]**		**The table appears**

See Also: Depreciation Calculator

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Interest Rate Conversions

Different types of investments have different compounding periods. For example, bank accounts generally pay interest monthly or daily; most bonds pay interest semiannually; stocks pay dividends quarterly; and many loans pay interest annually. In some cases banks will even pay interest compounded continuously. These various rates are knows as nominal interest rates and are compounded periodically. An interest rate of 15% per year compounded monthly (12 times per year) is an example of a nominal interest rate. If you want to compare investments with different compounding periods you must convert them to a common basis. You can do this by converting the nominal interest rates to an effective interest rate.

Converting interest rates

The interest rate conversion buttons on the business calculator may be used to convert between nominal and effective interest rates, using either periodic or continuous compounding. To convert between nominal and effective interest rates:

1. Select the compounding period **Per** for periodic -or- **Con** for continuous.

   If **Con** is selected, the **[P/Yr]** will not appear.
2. Key in the nominal (or effective) interest rate, and press **[Nom%]** (or **[Eff%]**).
3. For periodic compounding only, key in the number of periods per year, and press **[P/Yr]**.
4. Press **[Eff%]** (or **[Nom%]**) to calculate the effective (or nominal) annual interest rate.

Example: What bank do I use?

It is your lucky day! You just inherited a considerable amount of money and you must decide what bank to put it in. You have found three different savings account plans.
Bank #1: 5.22% annual interest, compounded quarterly.
Bank #2: 5.17% annual interest, compounded monthly.
Bank #3: 5.15% annual interest, compounded continuously.

Which one should you put the money in?

Solution: You will need to convert all three interest rates to an effective rate.

Enter	Display
Per (button)	
4 [P/Yr]	**4.00P/Yr**
5.22 **[Nom%]**	**5.22Nom%**
[Eff%]	**Eff%**
	5.32
12 [P/Yr]	**12.00P/Yr**
5.17 **[Nom%]**	**5.17Nom%**
[Eff%]	**Eff%**
	5.29
Con (button)	
5.15 [Nom%]	**5.15Nom%**
[Eff%]	**Eff%**
	5.28

You can see that Bank #1 is the best value because it has the highest effective rate at 5.32%.

See Also: Business Calculator

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Anatomy of a Bond

A bond is a long-term promissory note issued by a business or governmental unit. A bond will often contain many of the the following attributes:

- Par Value
- Maturity Date
- Call Provisions
- Coupon Interest Rate
- Bond Pricing
- Yield To Call
- Durations
- Zero Coupon Bonds

See Also: Bond Calculator, Bonds and Notes Overview

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Bond Pricing

Bond pricing: a bond's market price is determined primarily by its coupon interest payments. Generally the higher the coupon, other things held constant, the higher the market price of the bond. At the time a bond is issued, the coupon is generally set at a level that will force the market price of the bond to equal its par value. If a lower coupon were set, investors simply would not be willing to pay $1,000 for the bond; conversely, if a higher coupon were set investors would quickly bid its price over $1,000. Investment bankers can judge quite precisely the coupon rate that will cause a bond to sell at its $1,000 par value.

Once the bond has been issued, the price will fluctuate with changing economic conditions. Generally, when the market interest rate is higher than the bond's coupon interest rate, the bond will sell at a discount. On the other hand when the market rate is lower than the bond's coupon rate, the bond will sell at a premium. Since bond prices almost always fluctuate from the original par value, you must calculate the return using yield to maturity. **Yield to maturity** takes into consideration all present and future cash flows of the bond to determine the return.

Par Value

The stated face value of the bond; it is usually set at $1,000 and generally represents the amount of money the firm borrows and promises to repay at some future date.

Maturity Date

The date on which the par value must be repaid. Any maturity is legally permissible, although most bonds have original maturities of from 10-40 years.

Call Provisions

A provision which allows the issuer to pay the bond off prior to maturity. If a bond is callable, and interest rates decline, it is possible for the issuer to "call" the bond and refinance it with lower cost money. The call price will always be higher than the par value, thus the issuer must pay a premium for the privilege of being able to call the bond. The bond refinancing works very similar to the way you would refinance your house.

Coupon Interest Rate

A rate which requires the issuer to pay a specific number of dollars of interest every six months to a year. This payment is referred to as the coupon payment. The term is reminiscent of the early days when a bond literally had several small dated coupons attached to them. On the payment date, the owner would clip off the coupon and send it to the paying agent, who then mailed back the check for the interest. Today most bonds are registered, and the interest check is automatically mailed when due. The coupon interest rate may be determined by dividing the coupon by the par value.

Yield To Call

When a bond is purchased with a call option, and current interest rates are below the coupon rate there is a high chance the bond will be called. In this case, it is wise to calculate your expected rate of return by solving for yield to call. If xyz company issues a bond at 15% interest, and rates decline to 10%, xyx company will probably want to call the bonds and refinance with lower cost money. This will save xyz company $50 per bond per year.

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Durations
Most bonds pay coupon interest in addition to a final (par) payment at maturity. Depending on the relative magnitudes of these payments, a bond may be more or less like others with the same maturity date. A measure of the average time prior to receipt of payments is duration. In **PentaCalc Pro** duration (D) is calculated using the following equation:

Where N is the life of the bond in years, C is the cash receipt at the end of year n-equal to the annual coupon except for the last year, when it is equal to the annual coupon plus the maturity value-and i is the yield to maturity.

Zero Coupon Bonds
A bond that pays no interest until it matures. Zeros are offered at substantial discounts when first issued.

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Bonds and Notes Overview

PentaCalc Pro's bond calculator may be used to determine price, yield to maturity, yield to call, and accrued interest. It may also be used to calculate duration. When performing bond calculations, you must select one option from each of the following two parameters:

- Semiannual -OR- annual coupon payments.
- Semiannual coupon (interest) payments are typically made on U.S. bonds.
- Actual/Actual (days per month/days per year) -OR- 30/360 -or- Actual/360.
- U.S. Treasury bonds are Actual/Actual, most municipal, state and corporate bonds are 30/360 and most discounted notes such as US Treasury bills are Actual/360.

See Also: Anatomy of a Bond, Bond Calculations

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Notes

A note or bill is a written agreement to pay to the buyer of the note a sum of money, plus interest and has the following qualities:

- Notes do not have periodic coupons, since all interest is paid at maturity. A discounted note is purchased below its face value.
- By definition, no bill has a maturity at issue that is in excess of one year. A common example of a discounted bill is the U.S. Treasury bill.
- Bills of 13, 26, and 52 week maturities are sold on a discount basis in minimum $10,000 denominations.
- Treasury bill prices and yields are quoted somewhat uniquely among fixed-income securities, as a percentage discount from face value. The larger the percentage price quote, the larger the discount from face value.

PentaCalc Pro allows you to calculate the price per $100 of par value and the annualized bond equivalent yield.

See Also: Bonds Overview

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Bond Calculations

Example: Let's buy some bonds.

Part 1: Your company is currently going through a major downsizing. The CFO (Chief Financial Officer) and pension fund manager were told to hit the road. The next thing you know, you are promoted out of the mail room and put in charge of buying bonds. Since you graduated magna cum laude in Underwater Basket Weaving, you feel up to the task. After all, how hard could it be?

After reading some of the files the pension manager left behind, you decide that you need to maintain a 7.25% yield on the bonds you buy. It turns out Weavers, Inc. (you are familiar with this company because you bought a lot of weaving material from them in college) has an issue on the market with a coupon rate of 9.75% and a maturity date of April 1, 2007. The calendar basis is 30/360 and coupon payments are semiannual. Today is March 14, 1994. What are you willing to pay for this darling of the bond market?

Solution: Part 1. Select the 30/360 calendar basis and the semiannual coupon payments by clicking the appropriate radio buttons. Enter 3/14/1994 in the Settlement edit box, and 4/1/2007 in the Maturity edit box.

Enter	Display	Description
7.25 **[Yield Mat%]**	**7.25Yield Mat%**	rate of return
9.75 **[Coupon%]**	**9.75Coupon%**	coupon rate
[Price]	**120.86Price**	computes price
[Accrued Int]	**4.41Accrued Int**	interest
[Total]	**125.27Total**	total amount

Part 2: You discover that Weavers, Inc. has a call provision clearly outlined in the prospectus. The call price is 107 and is callable July 1, 1995. It is still March 14, 1994. What is your yield to call?

Solution: Part 2. Enter 7/1/1995 in the Call Date edit box.

Enter	Display	Description
107 **[Call]**	**107.00Call**	call to price
[Yield Call%]	**-0.80%Yield Call%**	yield to call

You really blew it this time since the bonds will get called and you will lose .80% while you hold them.

Example: Maybe it's time for a Treasury.

Your ego got a good sting after the little episode in the last example. However, being the resilient person you are, it was simply chalked up as one of life's lessons and you pressed forward. You decide to try something backed by the good faith and credit of the U.S. Government. You notice April 1, 2007 U.S. Treasury bonds with a 63/4% coupon are selling for 91. U.S. Treasury bonds pay interest on a semiannual actual/actual basis. Today is July, 1, 1995 (you just got your money from the Weavers, Inc. bonds that were called from the previous example). What is your yield to maturity with this bond?

Solution: Select the Actual/Actual calendar basis and the semiannual coupon payments by clicking the appropriate radio button. Enter 7/1/1995 in the Settlement edit box and 4/1/2007 in the Maturity edit box.

Enter	Display	Description
91.00 **[Price]**	**91.00Price**	market price
6.75**[Coupon%]**	**6.75Coupon%**	coupon rate
[Yield Mat%]	**7.94Yield Mat%**	yield to maturity

Example: Let's float some "zeros".

After the recent success in buying Treasuries, your company has given you the added responsibility of raising capital. The first fund raising project involves the development of a large shopping center. Your company will need 80 million dollars to build and develop the center. At the end of five years, the center should be fully developed and leased. Your company doesn't expect any major cash flows from the project until the end of the fifth year when the shopping center is sold. Currently, "zeros" are yielding 7%. What can you expect to sell your 5 year bonds for each? They accrue interest annually and are on a 30/360 basis.

Solution: Select the 30/360 calender basis and the annual coupon payments by clicking the appropriate radio buttons. You will issue the bonds on July 17, 1995. They will mature July 18, 2000. Enter 7/17/1995 in the Settlement edit box and 7/18/2000 in the Maturity edit box.

Enter	Display	Description
7 **[Yield Mat%]**	**7.00Yield Mat%**	enters yield
0 **[Coupon%]**	**0.00Coupon%**	coupon rate
[Price]	**71.29Price**	sell price

You need to sell 112,226 bonds, each at $712.85 to raise the money.

Example: What do I do with all this cash?

Your company, on occasion, has large amounts of cash on hand for relatively short periods of time (less than one year); you need to find a safe place to "store" this cash while getting the highest return possible, with the lowest possible risk. You decide to stash some of it in U.S. T-bills. Today is July 23, 1994. December 15, 1994, T-bills are trading at a 5.55% discount. What is the price per $100 par value and annualized treasury bill yield?

Solution: Select the A/360 option on the bond calculator. Enter 7/23/1994 in the Settlement edit box and 12/15/1994 in the Maturity edit box.

Enter	Display
5.55 **[Coupon%]**	**5.55Coupon%**
[Price]	**97.76Price**
[Yield Mat%]	**5.68Yield Mat%**

See Also: Bond Calculator, Bonds and Notes Overview, Anatomy of a Bond

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Annual / Semi Annual

- Semi Annual — Sets coupon payments on a semi-annual basis.
- Annual — Sets coupon payments on an annual basis.

Calendar Basis Buttons

- 30/360 — Sets the calendar basis to a 30-day month, 360-day year.
- A/A — Sets the calendar basis to the actual calendar month and year.
- A/360 — Sets the calendar basis to the actual calendar month, and a 360 day year. This setting is used for calculations involving debt instruments of one year or less, such as U.S. T-Bills.

Settlement
Date of purchase.

Maturity
Date on which the par value must be repaid.

Yield to Maturity
Computes or stores the yield to maturity expressed as an annual percentage.

Price
Stores or computes the price per $100 face value.

Coupon
Stores the annual coupon rate as a percentage.

Interest Accrued
Computes the interest accrued from the last coupon payment date until the settlement date per $100 face value.

Bond Total
Computes the interest accrued from the last coupon payment date until the settlement date per $100 face value.

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Duration
Computes the bond duration.

Yield To Call
Computes or stores the yield to call expressed as an annual percentage. See Also: Anatomy of a Bond

Call Price
Stores the call price per $100 face value.

Call Date
Date at which the bond may be called.

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Statistics Overview

PentaCalc Pro is capable of performing statistical calculations with both one and two variables. You can enter tables of data directly, or copy and paste from other applications. With a data pair entered in the X and Y registers, it is possible to calculate the various sums and products necessary for statistical calculations. Click on one of the following:

- Entering Data
- Importing Data
- Regression Analysis
- Single Variable Statistics

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Entering Data

PentaCalc Pro performs calculations on statistical tables, which can be imported from other applications or entered directly into the tape. Statistical operations are performed on the last statistical table above the current insertion point. If you have, for example, three different statistical tables in the tape, and you want to perform statistical operations on the second table, you must have the tape insertion point between the second and third table. **PentaCalc Pro** will now "look" above the insertion point, "find" the nearest statistical table, and perform the calculations you request. When making statistical entries, the tape is divided into the following four segments:

- The comment field
- The line number
- The X register
- The Y register

You may enter either x or y data points by first entering the data, then pressing either **[X]** or **[Y]**. The data points will be numbered on the left hand side for quick reference. If you desire to only enter a set of x data, then you must click the **[X]** button after each data point is entered. Conversely, you may also enter only y values by clicking only the **[Y]** button after entering the data.

See Also: Importing Data, Single Variable Statistics.

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Importing Data

It is possible to import a set of data from another application, and paste it into **PentaCalc Pro**. You may use standard Windows cut, copy, and paste conventions, including pasting over the top of highlighted sections from the clipboard. For example, if you have one or two columns of numbers in a spreadsheet and would like to use **PentaCalc Pro** to perform statistical analysis on the numbers, you may import the numbers by following these steps:

1. Press **[New]** on the statistics calculator to start a new list.
2. Copy one or two columns to the clipboard from another Windows application.
3. Select **Paste** from the **Edit** menu on **PentaCalc Pro**.

If you copied one column from another application, it will be pasted into the x column on **PentaCalc Pro**.

If you copied two columns, they will be pasted into the X and Y column of **PentaCalc Pro**.

If you copy three columns to the clipboard, they will fill the comment field, X and Y columns respectively.

It is also possible to insert data in the middle of a data table by setting the insertion point in the table and pasting the contents from the clipboard.

See Also: Entering Data, Single Variable Statistics.

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Viewing and Editing the List

Editing a number

All statistical data are stored in a list on the tape. You may edit individual numbers by using standard Windows editing conventions of highlighting, inserting or deleting text. Once you have made the desired changes, you may press **enter** on your keyboard and the new value will be calculated.

Inserting a data point

To insert a new data point:

1. Select **Set Insertion Point** from the **Edit** menu.
2. Use the cursor to click between the two data points where you want to insert the new data.

   -OR-

   Set the insertion point by clicking on the right mouse button with the cursor on the line where you would like the new insertion point to appear below.
3. Enter your data using **[X]** and **[Y]**.
4. Return the insertion point to the bottom of the tape by selecting Restore Insertion Point from the Edit menu.

   -OR-

   Right click the mouse on the bottom entry of the tape.

Deleting a data point

You may delete an entire data point by using the cursor to highlight the data point line, and pressing delete on your computer keyboard.

-OR-

You may select **Delete** from the **Edit** menu. It is also possible to delete several lines using the above method.

See Also: Statistics Overview, Entering Data**,** Single Variable Statistics.

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Single Variable Statistics

PentaCalc Pro can calculate many one variable statistics. Many of these statistics such as Sum of x and Sum of x squared are useful for other statistical calculations. Other one variable statistics are useful by themselves, such as the mean and standard deviation.

Using standard deviation

There are two types of standard deviation **PentaCalc Pro** is capable of calculating. **[sx]** or **[sy]** calculates the *sample standard deviation* and **[œx]** or **[œy]** calculates the *population standard deviation*. The sample standard deviation assumes that the data you have entered are a sample of a large population for which you are trying to estimate the standard deviation.

The *population standard deviation* assumes that the data you have entered are the entire population.

In the case of the car mileages (from the following example), the population standard deviation is the one you would want to calculate, because you own only 10 cars and those 10 cars are all you are interested in (they are the entire population). If your calculations were for the benefit of the EPA (to estimate the mileage for a certain model car based on a sample of 10 road tests) the sample standard deviation would be your deviation of choice, because the EPA would take your results and apply them to all cars of that model.

using single variable statistics

Example: A fleet of cars.

You are the fleet manager for your company motor pool of ten cars. You keep detailed records of the gas mileage by dividing the total miles driven by the number of gallons of gasoline consumed. The mileage figures are as follows:

Car Number	Mileage
1	23.68
2	19.56
3	25.45
4	21.96
5	22.12
6	23.56
7	24.62
8	23.42
9	21.56
10	19.96

You wish to calculate the mean and standard deviation of the mileage for your fleet of cars.

Solution: To enter the data:

1. Select Statistics from the Scientific subgroup of the Calc menu.
2. Enter the first data point (23.68) and press **[X].**

   PentaCalc Pro will create a new data list and display the first data point on your screen.
3. Follow step two for the remainder of the data points.
4. Select the various buttons to make the statistical calculations as shown below. We have also added range, sort, median, sum, and sum of X squared.

Enter	Display
[^{2}]	**22.59**
[›x]	**1.91**
[›x]	**225.89**

[›x»]	**5,135.52**
[Mdn x]	**23.56**
[Min x]	**19.56**
[Max x]	**25.45**
[Rng x]	**5.89**

See Also: Statistics Overview, Entering Data.

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Regression Analysis

Regression analysis shows the relationship between an independent variable (X) and a dependent variable (Y). For example, you may want to determine how gasoline prices affect national park usage, or how temperature affects sales of ice cream. The relationship between dependent and independent variables may be a linear estimate. **PentaCalc Pro** will generate a regression analysis with an equation in the form $y = mx + b$, where b is equal to the y intercept, m is the slope or X Coefficient, and x is the independent variable.

The regression outputs

When you select **[Regression Analysis]**, the following data is displayed:

Statistic	Explanation
Constant (Y-intercept)	The y-axis intercept of the regression.
Standard Error of Y Estimate	The estimated standard error of the y values.
r Squared	A statistic that shows the strength of the relationship between the independent and dependent variables.
No of Observations	The total number of X or Y variables.
X Coefficient (slope)	The coefficients of the independent (x) variables in the model or the slope of the regression line.

Using regression analysis

Example: The mosquito smashers.

Part 1: Your boss has put you in charge of the annual company party and mentioned that something must be done about the large number of mosquito that were present at last years party. He also mentioned, as he walked out of your office, that you are not allowed to use the little blue light machines that electrocute the creatures. You come up with the bright idea to turn the employees' children into mosquito smashers, but how do you give them an incentive and still stay within budget?

Solution: Part 1. You decide to conduct a test to find out what kind of correlation exists between "mosquito smasher pay" and productivity, and use the results to predict how many mosquito will get smashed with various pay rates. The results of the test are as follows:

"mosquito smasher" hourly pay	average mosquito smashed per hour
$0.50	**15**
$0.75	**22**
$1.00	**32**
$1.25	**52**
$1.50	**65**
$1.75	**70**
$2.00	**85**
$2.25	**98**
$2.50	**110**
$2.75	**124**

Enter the information from the mosquito smasher table into **PentaCalc Pro**. The hourly pay is the independent variable (x) and the number of mosquitoes smashed per hour is the dependent variable (y).

Enter		**Displa y**
[New]		
	Row#	XY
.5 **[X]** 15 **[Y]**	1	0.515
.75 **[X]** 22 **[Y]**	2	0.7522

1.00 **[X]** 32 **[Y]**	3	1.0032
1.25 **[X]** 52 **[Y]**	4	1.2552
1.50 **[X]** 65 **[Y]**	5	1.5065
1.75 **[X]** 70 **[Y]**	6	1.7570
2.00 **[X]** 85 **[Y]**	7	2.0085
2.25 **[X]** 98 **[Y]**	8	2.2598
2.50 **[X]** 110 **[Y]**	9	2.50110
2.75 **[X]** 124 **[Y]**	10	2.75124

[Regression Analysis]	**Regression Analysis**
-12.71	**Constant (Y-intercept)**
3.05	**Std Err of Y Est**
0.99	**R Squared**
10.00	**No. of Observations**
49.24	**X Coefficients (slope)**
1.34	**Std Err of Coef**

It appears you have found a very good correlation between pay and productivity. Now all you will need to do if the mosquitoes get too annoying is announce a "mosquito smasher" pay increase over the PA system and the little folks will spring into action.

Part 2. Calculate how much you will need to spend to smash 78 bugs per hour and how many bugs you will get smashed if you spend $2.37 per hour.

Solution: Part 2. You already have the regression information you need from Part 1. From here it is a few quick steps to forecast information.

Enter	**Display**	**Explanation**
78. **[X']**	**1.84**	required hourly pay
2.37 **[Y']**	**103.98**	mosquitoes smashed

See Also: Statistics Overview, Entering Data**,** Single Variable Statistics.

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X
Enters an x-value.

New
Creates a new statistical data table.

Y
Enters a y-value.

Sum of X
Displays the sum of the x-values.

Sum of Squares of X
Displays the sum of squares of the x-values.

Sum of Product of x and y
Displays sum of products of x and y values.

Sum of y
Displays the sum of the y-values.

Sum of y Squared
Displays the sum of squares of the y-values.

Mean of x
Displays the mean (arithmetic average) of the x-values.

Sample Standard Deviation of x
Displays the sample standard deviation of the x-values.

Standard Error
Displays the standard error of the y estimate.

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Mean of y
Displays the mean (arithmetic average) of the y-values.

Sample Deviation of y
Displays the sample standard deviation of the y-values.

Mdn of x
Displays the median of the x values. (The median is the number halfway down the list if the list were ranked smallest to largest. If there is an even number of data points then the median is the arithmetic average of the middle two numbers.)

Population Standard Deviation of x
Displays the population standard deviation of the x-values.

r
Displays the correlation coefficient of the x and y values.

Mdn x
Displays the median of the y values. (The median is the number halfway down the list if it were ranked smallest to largest. If there is an even number of data points then it is the arithmetic average of the middle two numbers.)

Population Standard Deviation of y
Displays the population standard deviation of the y-values.

Min x
Displays the smallest (minimum) number of the x-values.

Max x
Displays the largest (maximum) number of the x-values.

Slope
Displays the slope of the regression line.

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Min y
Displays the smallest (minimum) number of the y-values.

Max y
Displays the largest (maximum) number of the y-values.

Rng x
Displays the difference between the largest and smallest x-values.

Sort x
Reorders the x-values from smallest to largest.

Y Intp
Displays the y intercept of the regression line.

Rng y
Displays the difference between the largest and smallest y-values.

Sort y
Reorders the y-values from smallest to largest.

X'
Predicts an x value for a given y value.

Regression Analysis
Performs a regression analysis on the x and y values, and outputs a table of the data.

Y'
Predicts a y value for a given x value.

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Programming Overview

The programming calculator can be set up to various bases, word sizes, and flag settings, allowing you the flexibility of calculating almost any computer operation for double-checking, coding, and debugging.

- Perform bitwise operations on signed and unsigned binary, octal, decimal, and hexadecimal numbers.
- Use 8, 16, or 32 bit word sizes.
- Perform logical operations, such as AND, OR, NOT, and XOR.
- Use several shifting and rotating functions, such as arithmetic shifting and rotating with carry.
- Perform miscellaneous operations like modulus, extend, reverse, and swap.

IMPORTANT: Before performing calculations, you should set up the programming calculator. You can set:

- Numeric Base
- Word Size
- Signed or Unsigned numbers
- Preset or Clear the Carry and Overflow Flags

All of these settings can be made directly on the programming calculator

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Programming: Basic Operations

With **PentaCalc Pro**, you may perform several logical, shifting, rotating, and other miscellaneous operations. These operations are illustrated below.

- Converting Between Bases
- Logical Operations: AND, OR, NOT and XOR
- Shifting and Rotating
- Modulus
- Extend
- Reverse
- Swap

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Word Size

With **PentaCalc Pro**, you have the option of working in three different word sizes: 8 bit, 16 bit, and 32 bit. **PentaCalc Pro** limits the range of numbers you can use in your calculations, depending on the bit size you choose, and the status of the **Sign** check box.

The following is a table of the valid ranges in hexadecimal:

Mode	Word Size	Range
Unsigned	8 Bits	0...FF
Unsigned	16 Bits	0...FFFF
Unsigned	32 Bits	0...FFFFFFFF
Signed	8 Bits	80...7F
Signed	16 Bits	8000...7FFF
Signed	32 Bits	80000000...7FFFFFFF

Octal and binary bases have similar limitations, but the decimal base does not. The decimal base ignores the word size and **Sign** check box because this base is used by all other calculators in addition to the programming calculator. You may still use the decimal base with the programming calculator, but if you enter a decimal number and then convert it to another base, it will truncate the number, if necessary, to fit into the current word size.

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Programming Bases

PentaCalc Pro supports 7 different bases, however, only four of them are useful to the programming calculator:

Base	Explanation
Binary	Is base-2, and allows numbers comprised of digits 0 and 1.
Octal	Is base-8, and allows numbers comprised of digits 0 - 7.
Decimal	Is base-10, and allows numbers comprised of digits 0 - 9.
Hexadecimal	Is base-16 and allows numbers comprised of digits 0 - 9 and A - F.

Numbers can be entered in any base, and then converted to any of the other bases easily.

See Also: Programming: Overview

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Programming Sign

You have the option of working in either *signed* or *unsigned* mode. You can select signed mode by clicking on the **Sign** check box at the upper right corner of the programming calculator. When the box is not checked, **PentaCalc Pro** performs programming operations in unsigned mode. In unsigned mode, negative numbers cannot be represented. In signed mode, the most significant bit (of binary notation) is the sign bit. When the most significant bit is one, the number is negative. When the most significant bit is 0, the number is positive. For example, in the binary base and 8-bit word size, you may enter the number 10000001. If you are in unsigned mode, this represents the decimal number 129. If you are in signed mode, this represents the decimal number -127.

The signed or unsigned mode will not affect most of the operations you perform, just how they are interpreted. However, there are two exceptions to this. The first exception is converting between any base and decimal. If the most significant bit is 1 when you convert to decimal in signed mode, the result will be negative; in unsigned mode, the result will be positive. Another exception is left and right shifting. When the **Sign** box is not checked, the **[SL/ASL]** (shift left / arithmetic shift left) and **[SR/ASR]** (shift right / arithmetic shift right) buttons perform an unsigned shifting operation. When the **Sign** box is checked, the **[SL/ASL]** and **[SR/ASR]** buttons perform a signed shifting operation. Arithmetic shifts are signed shifts. They will preserve the most significant bit or sign bit of the number. More information on shifting and arithmetic shifting can be found in the Shifting and Rotating topic.

See Also: Programming: Basic Operations, Programming: Overview

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Carry and Overflow Flags

Most microprocessors have a flag register which is affected almost every time the microprocessor executes an instruction. The flag register is affected by such occurrences as zero result, signed result, carry, and overflow. In order to better emulate the computer, we have included two of these flags: *overflow* and *carry*. The overflow flag will be affected by such occurrences as computing a result which does not fit in the specified word size, and the carry flag will be affected by such occurrences as the value which is shifted out of one end of a number.

An "O" in one of the boxes at the upper-left corner of the programming calculator indicates an overflow. This usually means that after a multiplication, division, addition, or subtraction the result is too large to fit within the specified word size; however, the remainder of the result will still be displayed in the entry display.

A "C" in one of the boxes at the upper-left corner of the programming calculator indicates a carry. This usually means you have added two numbers together which are too large to fit within the current word size or you have subtracted a large number from a smaller one. Although the carry flag is set, the remainder of the calculation will still be displayed in the entry display. The carry flag is also set every time you rotate or shift a bit which is set out of the left or right side of a number.

You may clear or preset either of these flags by simply clicking on them. This will toggle them between on and off. This may occasionally come in handy, such as when you want to do rotating with carry and need to force the carry flag to be set at the start.

See Also: Programming: Basic Operations, Programming: Overview

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Converting Between Bases

With **PentaCalc Pro**, you can convert quickly between binary, octal, decimal, and hexadecimal bases.

- You can switch bases by either clicking on one of the four radio buttons on the far left side of the programming calculator

-or-

- By selecting one of the bases from the **Option** menu.

Example: Converting between bases.

Part 1: Convert FF from hexadecimal to decimal.
For this example, make sure you are in hexadecimal, 8-bit word size, and unsigned mode.

Enter	Display	Description
FF	**FFh**	enters the hex number
Dec	**255**	displays the decimal number

Part 2: Now convert the decimal number to binary.

Enter	Display	Description
Bin	**11111111b**	displays the binary number

In Algebraic or 10-key notation, only the number in the entry display will be changed when you switch bases. In RPN notation, only the current entry and the entire stack will be converted when you switch bases. *The tape will not record the conversion between bases unless you press [=] after each number*.

Example: Convert FF from hexadecimal to decimal with a tape record.

For this example, make sure you are in hexadecimal, 8-bit word size, and unsigned mode.

Enter	Display	Description
FF	**FFh**	enters the hex number
[=]	**FFh**	puts it on the tape
Dec	**255**	displays the decimal number
[=]	**255**	puts it on the tape

See Also: Programming: Basic Operations, Programming: Overview

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Logical Operations

This section covers the logical operations of **AND**, **OR**, **NOT** and **XOR**. Logical operations are very useful for boolean testing, and conditional statements. **AND**, **OR**, and **XOR** are binary operators, meaning that two operands are required to complete the calculation. **NOT** is a unary operator, meaning that only one operand is required to complete the calculation. All calculations below are assumed to be performed in 8-bit word size.

Example: Compute 101101 AND 111.

Enter	Display	Description
Bin		sets binary base
101101		enters first operand
[AND]	**0010 1101bAND**	enters AND operator
111 **[=]**	**0000 0111b=**	enters second operator
	0000 0101b	computes result

Example: Compute 101101 OR 111.

Enter	Display	Description
Bin		sets binary base
101101		enters first operand
[AND]	**0010 1101bOR**	enters OR operator
111 **[=]**	**0000 0111b=**	enters second operator
	0010 1111b	computes result

Example: Compute NOT 101101.

Enter	Display	Description
Bin		sets binary base
101101 **[NOT]**	**0010 1101bNOT**	enters operand
	1101 0010b	computes result

Example: Compute 101101 XOR 111.

Enter	Display	Description
Bin		sets binary base
101101		enters first operand
[XOR]	**0010 1101bXOR**	enters XOR operand
111 **[=]**	**0000 0111b=**	enters second operand
	0010 1010b	computes result

Example: Compute 2D AND 7.

Enter	Display	Description
Hex		sets hexadecimal base
2D		enters first operand
[AND]	**2DhAND**	enters XOR operand
7 **[=]**	**7h=**	enters second operand
	5h	computes result

All of these calculations can be performed in any of the other bases as well.

See Also: Programming: Basic Operations, Programming: Overview Top

Shifting and Rotating

This section covers the shifting and rotating operations of the programming calculator. Shifting and rotating are very fast and convenient ways for computers to do multiplication and division by factors of 2, and various other bit manipulations. The programming calculator allows 8 different kinds of shifting and rotating, including signed and unsigned shifting and rotating, with and without carry. Note [SL/ASL] and [SR/ASR] behave as signed or unsigned shifts, depending on whether or not the **Sign** box is checked. Remember, there is no functional difference between shift-left and arithmetic shift-left.

Below, when we refer to the least significant bit, we mean the first bit, or bit 0. When we refer to the most significant bit, we mean the last bit, or bit 7 in 8-bit word size, bit 15 in 16-bit word size, and bit 31 in 32-bit word size. When we say a bit is shifted into the carry flag, we mean the "C" appears in the box if the bit was 1, and the box is empty when the bit was 0.

All calculations below are done in the 8-bit word size. Although all calculations below are done in binary, they could just as easily be done in one of the other bases such as hexadecimal.

Shift-Left

[SL] shifts every bit one position to the left. The most significant bit is shifted into the carry flag and 0 is shifted into the least significant bit.

Example: Shift 11100111 left once.

Make sure the Sign box is not checked.

Enter	Display	Description
Bin		sets binary base
11100111	**1110 0111b**	enters the operand
[SL/ASL]	**1100 1110b**	shifts left one

The carry flag will be set, indicating that a 1 was shifted out of the most significant bit.

Shift-Right

[SR] shifts every bit one position to the right. The least significant bit is shifted into the carry flag and 0 is shifted into the most significant bit.

Example: Shift 11100111 right once.

Make sure the Sign box is not checked.

Enter	Display	Description
Bin		sets binary base
11100111	**1110 0111b**	enters the operand
[SR/ASR]	**0111 0011b**	shifts right one

The carry flag will be set, indicating that a 1 was shifted out of the least significant bit.

ARITHMETIC Shift-Left

[ASL] is identical to the operation of **[SL]**. See "Shift-Left" above for more information.

ARITHMETIC Shift-Right

[ASR] shifts every bit one position to the right arithmetically. The least significant bit is shifted into the carry flag and the most significant bit remains the same.

Example: Shift 11100111 right once arithmetically.

Make sure the Sign box is checked.

Enter	Display	Description
Bin		sets binary base
11100111	**1110 0111b**	enters the operand
[SR/ASR]	**1111 0011b**	shifts right once arithmetically

The carry flag will be set, indicating that a 1 was shifted out of the least significant bit.

ROTATE-Left

[ROL] rotates every bit one position to the left. The most significant bit is copied into the least significant bit, and into the carry flag.

Example: Rotate 11101110 left once.

Enter	Display	Description
Bin		sets binary base
11101110	**1110 1110b**	enters the operand
[ROL]	**1101 1101b**	rotates left once

The carry flag will be set, indicating that a 1 was rotated out of the most significant bit.

ROTATE-Right

[ROR] rotates every bit one position to the right. The least significant bit is copied into the most significant bit, and into the carry flag.

Example: Rotate 11101110 right once.

Enter	Display	Description
Bin		sets binary base
11101110	**1110 1110b**	enters the operand
[ROR]	**0111 0111b**	rotates right once

The carry flag will be clear, indicating that a 0 was rotated out of the least significant bit.

ROTATE-Left WITH CARRY

[ROLC] rotates every bit one position to the left, using the carry flag as an extended bit. The carry flag is rotated into the least significant bit, and the most significant bit is rotated into the carry flag.

Example: Rotate 11101110 left once with carry.

Enter	Display	Description
Bin		sets binary base
11101110	**1110 1110b**	enters the operand
[ROLC]	**1101 1100b**	rotates left once with carry

The carry flag will be set, indicating that a 1 was rotated out of the most significant bit. If another ROLC were done at this point, the least significant bit would be 1 since the carry flag is now set.

ROTATE-Right WITH CARRY

[RORC] rotates every bit one position to the right, using the carry flag as an extended bit. The carry flag is rotated into the most significant bit, and the least significant bit is rotated into the carry flag.

Example: Rotate 11101110 right once with carry.

Enter	Display	Description

Bin		sets binary base
11101110	**1110 1110b**	enters the operand
[RORC]	**0111 0111b**	rotates right one with carry

The carry flag will be clear, indicating that a 0 was rotated out of the least significant bit.

Miscellaneous Operations

The programming calculator provides a few other programming operations which may be of use to you: modulus, extend, reverse, and swap.

See Also: Programming: Basic Operations, Programming: Overview

Top

Modulus

[Mod] computes the integer remainder of a division of two operands.

Example: Compute 6C Mod 10.

Enter	Display	Description
Hex		
6C		sets hexadecimal base
[Mod]	**6ChMod**	enters the Mod operator
10 **[=]**	**10h=**	enters the second operand
	Ch	computes results

See Also: Programming: Basic Operations, Programming: Overview

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Extend

[Ext] copies the most significant bit of an operand until it fills the remaining bits of the specified word size under certain conditions. **[Ext]** is intended to allow you to enter or compute a smaller number than the specified word size and then fill the remaining empty bits so that the number is in proper two's complement format. It is implied that when you use this function, the operand is a signed number and hence the sign bit is being extended. In the 8-bit word size, it does nothing. In the 16-bit word size, it will copy bit 7 throughout bits 8 - 15 if bits 8 - 15 are all 0. In the 32-bit word size, it will copy bit 7 throughout bits 8 - 31 if bits 8 - 31 are all 0, and it will copy bit 15 throughout bits 16 - 31 if bits 16 - 31 are all 0.

Example: Extend 11100111 into 16 bits.

Select the **16 Bits** word size.

Enter	Display	Description
Bin		sets binary base
11100111	**0000 0000 1110 0111bExt**	enters the operand
[Ext]	**1111 1111 1110 0111b**	computes result

Example: Extend 11100 into 32 bits.

Select the **32 Bits** word size.

Enter	Display	Description
Bin		sets binary base
11100	**0000 0000 0000 0000 0000 0000 0001 1100bExt**	enters the operand
[Ext]	**0000 0000 0000 0000 0000 0000 0001 1100b**	computes the result

Notice that the result is the same as the operand since bits 8-31 are 0, and bit 7 is 0.

Example: Extend CCC7 into 32 bits.

Select the **32 Bits** word size.

Enter	Display	Description
Hex		**sets the binary base**
CCC7	**FFFF CCC7hExt**	enters the operand
[Ext]	**FFFF CCC7h**	computes the result

See Also: Programming: Basic Operations, Programming: Overview

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Reverse

[Rev] exchanges the bits around the middle of the specified word size. The most significant and least significant bits are exchanged. The second most significant and second least significant bits are exchanged, and so forth.

Example: Reverse 11001001.

Select the **8 Bits** word size.

Enter	Display	Description
Bin		sets binary base
11001001 **[Rev]**	**1100 1001b**	enters the operand
	1001 0011b	computes the result

Example: Reverse 1111000010100101.

Select the **16 Bits** word size.

Enter	Display
Bin	
1111 0000 1010 0101 **[Rev]**	**1111 0000 10100 101b**
	1010 0101 0000 1111b

See Also: Programming: Basic Operations, Programming: Overview

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Swap

[Swap] exchanges the upper half of the specified word size with the lower half. All bits in each half will maintain their orientation with respect to each other. They will only be moved to the opposite half.

Example: Swap 11001010.

Select the **8 Bits** word size.

Enter	Display	Description
Bin		sets binary base
11001010 **[Swap]**	**1100 1010b**	enters the operand
	1010 1100b	computes the result

Example: Swap 1111000010100101.

Select the **16 Bits** word size.

Enter	Display
Bin	
1111 0000 1010 0101 **[Swap]**	**1111 0000 1010 0101b**
	1010 0101 1111 0000b

See Also: Programming: Basic Operations, Programming: Overview

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And
Obtains the logical product (AND) of two operands.

Carry
When the Carry check box is checked, the carry flag is set. See Also: Carry and Overflow flags

Overflow
Shows the state of the overflow flag.

Sign
Sets the calculator to signed or unsigned mode.

Word Size
Sets the word size.

OR
Obtains the logical sum (OR) of two operands.

NOT
Obtains the negation (NOT) of an operand within the specified word size.

XOR
Obtains the exclusive logical sum (XOR) of two operands.

SL/ASL
Shifts the displayed value one bit to the left. In the case of shifting left, the operations of SL and ASL are identical. The status of the **Sign** check box does not matter.

ROL
Rotates the displayed value one bit to the left.

ROLC
Rotates the displayed value one bit to the left, but uses the carry flag as an extended bit.

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SR/ASR
Shifts the displayed value one bit to the right. **[SR/ASR]** performs an arithmetic shift-right if the **Sign** box is checked.

ROR
Rotates the displayed value one bit to the right.

RORC
Rotates the displayed value one bit to the right, but uses the carry flag as an extended bit.

Mod
Obtains the integer remainder of a division of two operands. See Also: Modulus

Ext
Extends the most significant bit of a number into the remaining bits until the specified word size is filled. See Also: Extend

Rev
Reverses the bits of a number around the center of the number.

Swap
Swaps the upper-half bits with the lower-half bits of a number.

Bases

- Bin: Binary base (base 2)
- Oct: Octal base(base 8)
- Dec: Decimal base (base 10)
- Hex: Hexadecimal base (base 16)

See Also: Programming Bases.

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Units Overview

PentaCalc Pro's unit calculators are very simple to use. Smart Units have unprecedented power. You may quickly convert between hundreds of different units, and even make calculations using combinations of different units. You can perform calculations using kg, feet, and seconds, having the results always cancel down to the most simple unit.

To use a unit conversion calculator, select the type of unit you wish to use from the Unit Conversions subgroup on the Calc menu. You, of course, may run several unit conversion calculators at the same time, or drag and drop buttons from any of them to another calculator.

- Converting Between Two Units of the Same Type
- Using Units in Calculations

Top

Converting Between Two Units of the Same Type

To convert between two units of the same type:

1. Select the type of unit you wish to convert between from the Unit Conversions subgroup on the Calc menu. For example, if you wish to convert between meters and feet, select the Length calculator.
2. Enter the first value, and select the unit button you wish to convert from.
3. Select a unit button of the same type to which you wish to convert.

Example: Convert 1.3 yards to centimeters.

Select the **Length** calculator from the **Unit Conversions** subgroup on the **Calc** menu.

Enter	Display
1.3 **[yd]**	**1.30yd**
[cm]	**118.87cm**

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Using Units in Calculations

We all know that one cannot add apples and oranges; we must add like units. When the numbers in a formula are manipulated correctly, their units cancel out to leave the final answer in the appropriate units. If the problem is set up incorrectly, the units will not cancel properly, and there will be no doubt that a mistake has been made. Smart Units take the work out of keeping track of units. As you perform calculations, Smart Units will automatically cancel units and output the answer in its simplest form. The use of a unit button in a calculation is optional. If you wish to use a unit in a calculation, simply enter the number, assign a unit by pressing a unit button, and then press an operator.

Example: A metal plate needs a coat of paint 1.00 mm thick, and the area covered is 36.0 square inches. How many pounds of paint are required to coat the plate? (The paint has a density of .805 g/cm¼.)

Solution: The mass of paint needed can be calculated from the product of the thickness, area, and density. Normally, this would create a problem since the dimensions are in different units. However, with Smart Units your concerns about unit dimensions are eliminated. The answer to this problem is as simple as multiplying the three dimensions together: 1.00 mm x 36 inches» x .805 g/cm¼. You will need to open the length, area, mass and density calculators. The output for this problem assumes that you have selected Smart Unit level three from the Configure... item on the Option menu. You will also need to set your output to four decimal places by selecting Fixed... from the Option menu. We decided to create a new calculator called "Metal Plate" and drag and drop the various buttons onto it.

Enter	Display
1 **[mm] [˜]**	**1.0000mm**
36 **[in»]**	**36.0000in»**
[˜] 0.805 **[g/cm¼] [=]**	**0.187kg**
[lb]	**0.0412lbs**

Notice the volume units cancel each other and the final answer comes out in kilograms. We needed to see the answer in pounds so we selected **[lb]**.

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Creating Units

PentaCalc Pro's Smart Units is a complex method of evaluating units. Most of this complexity is transparent to you as the user. However, occasionally, you may need to "lift the hood" and create your own units. Fortunately, creating new unit conversion buttons and configuring Smart Units is a rather straight forward process. To create a new unit, you must first understand what makes Smart Units "tick."

Smart Units are composed of a hierarchal structure: type, base, and unit. Each base and unit must be composed of atomic units. Atomic units are units which have been reduced to their elemental form. Atomic units can be found in ten calculators we ship with **PentaCalc Pro**: Temperature, Length, Mass, Time, Substance, Luminance intensity, Currency, Current, Angle and Solid angle.

Within each of these ten calculators, there is one unit that is unique and has earned membership in the Special ten group. (All other units within these ten calculators are both special and atomic, but they are not as special as the Special ten.) The Special ten consist of a modified S.I. base. In addition to the seven base S.I. units (Length-meters, Mass-kilograms, Thermodynamic temperature-kelvin, Electric current-amperes, Luminous intensity-candela, Amount of substance-moles and Time-seconds) we have included the supplementary S.I. base units (Plane angle-radian and Solid angle-steradian). Finally, we added a non S.I. unit (Currency-US dollar).

The base must be composed of a combination of Special ten units only, while a unit may be composed of any atomic unit (meaning a unit must be composed of units from any of the ten calculators mentioned previously in this section). In general, bases provide a way to separate units into systems such as S.I. and English. There will generally be one base per system in each unit type.

Bases exist for two reasons:

- They allow more accurate conversions. For example, 12 inches = 1 foot and 3 feet = 1 yard exactly. Instead of listing all units in terms of the Special ten unit, meters, where the conversion factors are often long and imprecise, they are listed in terms of their base where the conversion factors are usually exact. Conversions between units of the same base will often be more precise than if you cross bases.
- It is easier and more convenient to create units in terms of a base because the conversion factors are better know. For example, you know how many feet are in a yard, but generally you don't know how many meters are in a yard.

- Unit Composition
- Creating a Unit Button
- Editing a Unit Conversion Factor
- Creating a New Base

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Unit Composition

PentaCalc Pro's Smart Units are designed to allow you to "mix apples and oranges" when performing calculations involving units. However, when you dig a little deeper into Smart Units, you find that eventually the old axiom is still true and you really do need to compare apples to apples. This is accomplished by defining the composition of each unit. When you enter a composition for a unit, you are essentially describing how the unit is derived. If you would like to create your own units, you must understand how the composition is used. It is used in three ways:

- The composition allows **PentaCalc Pro** to simplify the unit when numbers involving units are combined by multiplications or divisions. If two or more units are combined which match the composition exactly of another unit, **PentaCalc Pro** will output the name of the matching unit instead of the combination of units. For example, if you multiply pounds by feet and divide by seconds squared, the combination of units will be "lb*ft/s^2". This matches the composition of pound-force (lbf) exactly, so the simplified unit of "lbf" will be used instead.
- The composition allows **PentaCalc Pro** to break units down to their fundamental parts and combine or cancel them when performing multiplication and division calculations involving units. For example, if you divide newtons by m/s», the result will be output in a single mass unit. **PentaCalc Pro** must know that newtons consists of mass multiplied by length divided by seconds squared.
- The composition also allows **PentaCalc Pro** to associate units of like type. When you are trying to convert directly between units or indirectly by performing mathematical operations on numbers involving units, **PentaCalc Pro** must first determine if they are compatible units, and then make the appropriate conversions. For example, if you convert from inches to feet, **PentaCalc Pro** first checks to see that feet are composed of meters, it discovers that inches are based on feet, which are composed of meters. Only when the meters to meters relationship is discovered, can the conversion take place.

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Creating a Unit Button

To create a new unit button, follow these steps:

1. From the **File** menu, select **New Button...**

   The Button Properties dialog box will appear:

2. Enter a unit name. This name will appear on the button, and will be printed in the operator field of the tape interface when the newly created button is pressed.
3. You may specify a hot-key which can be used to quickly execute your new button.
4. Select "Unit" for the type of button you would like to create.

   The Button Properties dialog box will transform to a Button Properties dialog box specific to the creation of unit buttons.

5. Enter the long name for the unit.

   The long name will appear on the comment display of the tape interface when the newly created button is pressed.

6. Enter a conversion factor, and select a base. If a base is not listed, press **[Edit Base]**, and follow the instructions in the "Creating a new base" section below.
7. If the conversion factor is an exact factor, select the **Exact Factor** option.

   When this option is checked, all conversions involving this unit will be performed to an infinite degree of precision. If this option is not checked, the conversions will be performed to the number of significant digits entered.

8. Enter the composition of the new unit.

   The composition must consist of atomic units. When entering compositions, all numerator units must be to the left of the "/" and all denominator units must be to the right of the "/". Otherwise, units must be separated by an "*". Each unit may have an exponent between 2 and 9. The exponent must be positive. Smart Units will not accept any other operator or parenthesis. Smart Units will only accept unit names, * (multiply), / (divide), and ^ (for exponents). For example, you may enter: kg*m^2/s^2. You may not however enter two units of the same type. For example, ft^2/m is not allowed, since feet and meters are of the same unit type.

9. Select **[OK]**, and the mouse cursor will change to the outline of a button. Place the new button outline on one of **PentaCalc Pro**'s calculators and click the left mouse button. The new button will be placed. You can reposition a button by clicking and holding down the left mouse button while dragging it into a new position and releasing the mouse button.

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Editing a Unit Conversion Factor

Occasionally, you will want to edit a unit conversion factor, such as when currency conversion rates change. The example below illustrates this procedure:

Example: The Canadian dollar is now worth .7538 U.S. dollars. You need to change this conversion factor in the currency conversion calculator.

Solution:

1. Select **Currency** from the **Unit Conversion...** submenu on the **Calc** menu.
2. Double click on the **Canadian dollar button** with the right mouse button.

   -or-

   Click on the Canadian dollar button with the right mouse button, and select **Button Properties...** from the **File** menu.

   The Button Properties dialog box will appear.
3. Replace the current conversion factor with .7538.
4. Select **[OK]**.

You may now make calculations with the button.

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Creating a New Base

Each unit type has one or more bases to which units are linked. In turn, each base is linked to all other bases in terms of the Special ten units. For example, you have three lists of conversion factors for mass. One list has conversion factors in terms of pounds, another list has conversion factors in terms of grains, and the final list is in terms of kilograms. When creating the new units, you will create three bases: grains, pounds, and kilograms. As you create each base, it must be equated to the other bases in terms of the Special ten unit. In this case, the mass Special ten unit is kilograms. Thus, once you have created the three bases, they will all be equated to each other in terms of the Special ten unit kilograms.

PentaCalc Pro ships with a very comprehensive set of units. Chances are you will never need to create a new base, unless you create an entirely new unit type.

To create a new base:

1. Select **Configure...** from the **Option** menu.

   The Configure dialog box will appear.

2. Select "Edit Base".

   The Edit Base dialog box will appear.

3. Enter the new base, or select a base from the list.

   Bases must be in terms of the Special ten units.

4. Enter the conversion factor in terms of one or more Special ten units.

5. If the conversion factor is an exact factor, select the **Exact Factor** option.

   When this option is checked, conversions will be performed to an infinite degree of precision. If it is not checked, the conversions will be performed to the number of significant digits entered.

6. Enter the composition for the new base.

   The rules for entering the composition of a new base are exactly the same as entering the base for a new unit, except only Special ten units may be used.

7. Select **[OK]**.

Example: A two headed what?

Part 1: Create a new system of length consisting of the following units: toes, elbows, knees, fingers, wrists, heads, and spinal columns.

Solution: Part 1. This example should provide a comprehensive illustration of how to create new units by creating a new calculator, units, and a base. You will need to create a new calculator named "Body Parts". "Body Parts" will be a length unit type. The button name, long name, conversion factor, base, and composition for this new system is located in the table below. To solve this example, follow these steps:

1. Create a new calculator called "Body Parts", and place it in the Unit Conversions subgroup. For more information, see Creating a Calculator.
2. Since all of your units are in terms of toes, you will want to create a new base called toe. Since bases must be in terms of a Special ten unit and the Special ten unit for length is meters, your toe base must be expressed in meters. We have measured 1 toe to equal exactly .03048 meters according to a sampling of 100,000 men and women in the US at the age of 25. To create the new base:

a. Select **Configure...** from the **Option** menu.

b. Select **[Edit Base]**.

   The Edit Base dialog box will appear.

c. Enter "toe" for base, ".03048" for the conversion factor and "m" for the composition as shown in the dialog box below and select **Exact Factor**.

d. Select **[OK]**.

3. Create the "toe" button, and place it on the "Body Parts" calculator. (You may do this by selecting **New Button...** from the File menu)
4. Select "Unit" for the type of button.

   The Button Properties dialog box will transform to a box specifically for creating unit buttons.

5. Enter the information directly from the table into the Button Properties dialog box.

Button Title	Hot key	Long Name	Conversion Factor	Base	Composition
toe	t	toes	1 toe = 1 toe	toe	toe
finger	f	fingers	1 finger = 2 toe	toe	finger
knee	k	knees	1 knee = 4 toe	toe	toe
wrist	w	wrists	1 wrist = 8 toe	toe	finger
head	h	heads	1 head = 15 toe	toe	head
spinal	s	spinal columns	1 spinal column = 27 toe	toe	head

6. Select **[OK]**.

   The cursor will change to the form of a button and you may place it on the "Body Parts" calculator.

7. Follow steps 3-6 for the knee, finger, wrist, head, and spinal buttons.

   When finished, you should have a calculator similar to the one below.

Part 2: Let's use our new calculator to find out how many spinal columns are in a meter?

Solution: Part 2. You will need to bring up the length calculator from the Unit Conversions subgroup on the Calc menu.

Enter		Display
1 **[m]**	**meters**	**1.0000**
[spinal]	**spinal columns**	**1.2151**

If you wish to delete the "Body Parts" calculator you must first delete each button on the calculator, and then select Delete Calculator from the Edit menu.

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Configuring Smart Units

PentaCalc Pro's Smart Units were designed with a high level of customization in mind. You may determine exactly how you would like the result of your unit calculations output.

Preferred Smart Unit Output

There are instances when several units will have the same composition. For example, two unit types (Torque and Energy) have the units Newton meter (Nm) and Joule (J) respectively. Each of these units have the composition, kg*m^2/s^2.

PentaCalc Pro allows you to specify which unit to output when it arrives at the composition of kg * m^2/s^2. If you work in torque units most of the time, you will probably select Nm; if you work in energy, you will probably select J. You may access **[Preferred Smart Unit Output]** from the **Configure..**. item on the **Option** menu.

In the example cited above, you may either enter the unit name Nm, or J

-or-

the composition kg*m^2/s^2. When you select **[Search]**, the current preferred output will appear in the Preferred Output combo box. You may view all possible outputs by clicking on the combo box. Click on the new preferred unit output, and press **[Accept]**. When you are finished specifying preferred unit outputs, select **[Exit]**.

Preferred Smart Unit level

With Smart Units, you may specify exactly what level of simplification you would like the results of your calculations to be. This feature is to help specify what form your answer will be in when you deal with units which are combined by multiplication and division.

To access the Smart Units Level dialog box:

1. Select **Configure...** from the **Option** menu and press **[Smart Units Level]**.

   The Smart Units Level dialog box will appear.

2. Choose a Smart Unit level:
   Don't convert at all, display as a combination. There will be no simplification or canceling of units. For example, if you perform a calculation in the form kg x m /s» the output will come out exactly in that form. It will not simplify to the S.I. unit of Newtons.

   Level 1: Convert if they match the composition of another unit. This option will only search for an exact match to the units as entered. For example, if you perform a calculation in the form; lb x ft / s» the output will be in lbf (pound force). This is because it is an exact match. If you were to substitute inches in the place of feet, Smart Units would output in lb x in/ s» which is the unsimplified version since there is no match.

   Level 2: Try to find a match by converting units to their bases. If Smart Units doesn't find an exact match it will systematically convert each unit to its base until it finds a match. For example, if you perform a calculation in the form lb x in/s», Smart Units will first check for an exact match using the method outlined in level one. Since it wouldn't find a match. Smart Units will then check lb and confirm it is in its base of lb already. It will then check inches, discover it needs to be in feet and convert it. It will then search for a match and this time will find one with lbf (pound force) and output the result in lbf.

   Level 3: Try harder to find a match by converting bases to their S.I. compositions. If Smart Units doesn't find an exact match using the logic outlined in the previous levels, it will start

converting units to their S.I. bases. For example, if you perform a calculation in the form kg x in / s», Smart Units will first check kg and see that it is in terms of its S.I. base. It will then check inches and convert it to the S.I. base, meters and then check for an exact match and will find one with the S.I. unit of Newtons.

3. Select **[OK]**.

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Sin
Computes the sine of an angle. To compute the sine of an angle, first enter the angle in degrees, radians, or grads (depending on what mode you have selected), and then select **[Sin]**.

Cos
Computes the cosine of an angle. To compute the cosine of an angle, first enter the angle in degrees, radians, or grads (depending on what mode you have selected), and then select **[Cos]**.

Tan
Computes the tangent of an angle. To compute the tangent of an angle, first enter the angle in degrees, radians, or grads (depending on what mode you have selected), and then select **[Tan]**.

Angle Mode Box
Shows which of the following angle modes **PentaCalc Pro** is calculating:

- degrees (1/360 of a circle)
- radians (1/2Pi of a circle)
- grads (1/400 of a circle)

Pi
The transcendental number Pi cannot be represented in a finite decimal form. In general, **PentaCalc Pro**'s approximation yields results accurate to 15 digits, which is sufficient for most applications.

Sin€ (Inverse Sin)
Computes the arc sine (inverse of sine) of the displayed number.

Cos€ (Inverse Cos)
Computes the arc cosine (inverse of cosine) of the displayed number.

Tan€ (Inverse Tan)
Computes the arc tangent (inverse of tangent) of the displayed number.

n!
Computes the factorial of the displayed number.

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Conj
Displays the complex conjugate of a complex number.

Ln
Computes the natural logarithm of the displayed number.

Log
Computes the common logarithm of the displayed number.

y to the xth power
Raises the base number y to the x power. For example, if you want to raise 6 to the 4th power, you would enter 6, select **[y•]**, enter 4, and select **[=]** or any other operator. 1,296.00 will be displayed.

Im
Computes the imaginary part y of its complex number argument (x,y). y is also the vertical coordinate of the point (x,y).

Re
Computes the real part x of its complex argument (x, y). x is also the horizontal abscissa coordinate of the point (x,y).

e• (Natural Exponent)
Computes the natural exponential to base e.

10° (Antilogarithm)
Computes 10 to the x power. **[10°]** is also the common antilogarithm.

xth root of y
Computes the xth root of the number y. For example, to calculate the 4th root of 16, enter 16, select **[†‡]**, enter 4, then press **[=]** or another operator. 2 will be displayed.

R->P
Converts a complex number in rectangular notation (x,y) to polar notation (r,Ø).

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P->R
Converts a complex number in polar notation (r,Ø) to rectangular notation (x,y).

Sinh
Computes the hyperbolic sine of the displayed number.

Cosh
Computes the hyperbolic cosine of the displayed number.

Tanh
Computes the hyperbolic tangent of the displayed number.

Abs
Computes the absolute value of the displayed number. If the number is complex [Abs] displays the magnitude of the complex number (x,y).

Arq
Computes the polar angle Ø of a complex number (x,y). Ø is expressed in degrees, radians or grads depending upon what angle mode is selected from the Option menu.

Sinh€ (Inverse Sinh)
Computes the inverse hyperbolic sine of the displayed number.

Cosh€ (Inverse Cosh)
Computes the inverse hyperbolic cosine of the displayed number.

Tanh€ (Inverse Tanh)
Computes the inverse hyperbolic tangent of the displayed number.

Sign
Computes the unit vector in the direction of (x, y) for a complex number argument (x,y).

,
The comma separator for entering rectangular or polar numbers.

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Trigonometric functions

PentaCalc Pro is capable of calculating the trigonometric functions and their inverses using degrees, radians, or grads. The default mode is degrees. To change the angular mode, make the selection from the Option menu.

Example: Let the flag fly.

Your company recently erected a new flagpole, and the city engineer has just informed you that it is too high and in violation of city ordinances. He said the maximum height for a flagpole is 75 feet. When you asked him how he knows your flagpole is over 75 feet, he curtly replies, "I know my flagpoles." You are sure it is under 75 feet, but how can you prove it?
Note: If we have offended any city engineers with this example, we apologize.

Solution: This is a simple trigonometry problem. If you know one angle and one side of a right triangle, you can solve for any other angle or side. You know a spot in the parking lot that is exactly 125 feet away from the flagpole. You also have an inclinometer (an instrument with a sighting device used to measure the angle between the horizon and some point above the horizon). A quick check with the inclinometer shows the angle between the spot in the parking lot and the top of the flagpole is 27.5°. You may now use the tangent function to solve the equation: (Tan 27.5°)(125 ft) = the height of the flagpole. Make sure **PentaCalc Pro** is in degrees mode before calculating this example.

Enter	Display	Description
27.5 **[Tan]**	**0.52**	computes tangent of 27.5°
[˜] 125 **[=]**	**65.07**	height of flagpole

Thus you are able to prove that the flagpole will comply with the ordinance and have 10 feet to spare.

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Rectangular and Polar Conversions

A point in a plane can be described by either polar or rectangular coordinates. Polar coordinates are r (magnitude) and o (angle); rectangular coordinates are x (horizontal) and y (vertical). **PentaCalc Pro** provides two buttons, **[RŒP]** and **[PŒR]**, for converting between rectangular and polar coordinates. You must pay attention to which angle mode (ie. Deg, Rad, and Grad) you are in before you convert because the answer will be different with each mode.

All operators and functions in **PentaCalc Pro** assume complex numbers to be in rectangular format, not polar. For example, if you enter the number (5,53.13), thinking to yourself that this represents a polar coordinate with absolute value 5 and angle 53.13°, and then compute the sine, you will get an incorrect result because **PentaCalc Pro** assumed the number (5,53.13) meant x coordinate 5 and y coordinate 53.13. See the following example for the correct way to perform this operation.

Example: Computing the sine of the polar complex number (5,53.13) and display the result as a polar complex number.

Make sure that your angle mode is set to Degrees from the Option menu.

Enter	Display
5 **[,]** 53.13 **[PŒR]**	**(3,4)**
[Sin]	**(3.85,-27.02)**
[RŒP]	**(27.29,-81.88)**

Example: The hike

Part 1: You have decided to go on a little hike. You start out on a bearing of 15° and walk for 1.5 miles; you then change course to a bearing of 45° and walk for another 2.2 miles. Where does your trip end relative to your starting position? Express your answer in rectangular coordinates.

Make sure that angle mode is set to Degrees from the Option menu.

Enter	Display
1.5 **[,]** 15 **[P'R] [+]**	**(1.45,.39)**
2.2 **[,]** 45 **[P'R] [=]**	**(3.00,1.94)**

Your trip has landed you 1.94 miles straight ahead and 3.00 miles to the right.

Part 2: Where does your trip end? Express your answer in polar coordinates?

Enter	Display
[R'P]	**(3.58,32.90)**

Since the shortest distance between two points is a straight line, your hike would have been faster had you walked 3.58 miles at a bearing of 32.90°.

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10-key Overview

PentaCalc Pro has a powerful 10-key style tape calculator which emulates the 10-key style calculator you may be used to. **PentaCalc Pro** has all the features of a regular adding machine such as auto-decimal place, tax, GPM, totals, item counters; 5/4, up, or down rounding, and red negative entries. **PentaCalc Pro** offers some strong reasons to put the adding machine away for good:

- Since **PentaCalc Pro** keeps a detailed tape of your calculations you can edit numbers or operators, and then easily recalculate the tape.
- You can make annotations to each numerical entry.
- You may save the tape as a file or print a copy for future reference.
- You will save room on your office desktop by getting rid of your adding machine.
- You can transfer numbers between **PentaCalc Pro** and other applications in a snap using Quick/Copy Paste.

Selecting the 10-key calculator

For a detailed description of the 10-key notation see 10-key Notation. You may access the 10-key calculator by selecting **10-key** from the **Financial** subgroup on the **Calc** menu. You will also need to select **10-key Notation** from the **Option** menu.

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Configuring the 10-key Calculator

This topic contains a detailed explanation of how to configure and use **PentaCalc Pro**'s 10-key calculator.

Any time you are in 10-key mode, all negative numbers will be displayed in red.

Setting the Item counter and rounding

To set the item counter or rounding options:

1. Select **Configure...** from the **Option** menu.
2. Select **[10-key]**.
3. The Configure 10-key dialog box will appear.

If you are in 10-key notation, each time you press either **[Sub]** or **[Total]** an item count will appear to the left of the total. You have the option of having the item count increment by one each time you press **[+]** or of having it increment by one each time you press **[+]** and decrease by one each time you press **[-]**. You may select **Increment every add only** or **Increment on every add and decrement on every subtract**, by selecting the appropriate radio box.

You may also specify what type of rounding options you would like:

Option	Result
Up	Results are rounded up to the number of significant digits indicated by selecting **Fixed...** from the **Option** menu.
5/4	Results are rounded up or down depending on the value. For example, if the number of significant digits is set to 2, a result is rounded up if the value in the third decimal position is 5 or more, or rounded down if 4 or less.
Down	Results are rounded down to the number of significant digits indicated by selecting **Fixed...** from the **Option** menu.

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Calculating Totals

The total keys are very useful when you need to keep track of separate totals especially those that are, in turn, grouped together to form other totals.

Button	Function
[Sub]	Prints the current subtotal. However, **[Sub]** will not clear the running total.
[Total]	Prints the total and resets the display to zero. However, the total of totals remains in the grand total register.
[GT]	Prints the grand total register, which is a total of all totals previously performed on the current tape. You may clear the grand total register by pressing **[GT]** twice or **[AC]** once.

Example: You run a small business and would like to add your monthly and quarterly expenses with a monthly subtotal of utilities. If you have not already done so, select **10-key Notation** from the **Option** menu. This will switch you to 10-key entry notation.

January		**February**		**March**	
Utilities		Utilities		Utilities	
Gas	$89	Gas	$79	Gas	$64
Elec	$35	Elec	$27	Elec	$29
Rent	$750	Rent	$750	Rent	$750
Telephone	$102	Telephone	$106	Telephone	$115

Enter	**Display**	**Tape Display**
January		
89 **[+]**	**89.00**	**89.00+**
35 **[+]**	**124.00**	**35.00+**
[Sub]	**124.00**	**(2 Items) Subtotal 124.00s**
750 **[+]**	**874.00**	**750.00+**
102 **[+]**	**976.00**	**102.00+**
[Total]	**976.00**	**(4 items) Total 976.00t**
February total		
79 [+]	**79.00**	**79.00+**
27 **[+]**	**106.00**	**27.00+**
[Sub]	**106.00**	**(2items) Subtotal 106.00s**
750 **[+]**	**856.00**	**750.00+**
106 **[+]**	**962.00**	**106.00+**
[Total]	**962.00**	**(4 items) Total 962.00t**
March Total		
64 [+]	**64.00**	**64.00+**
29 **[+]**	**93.00**	**29.00+**
[Total]	**93.00**	**(2 items) Subtotal 93.00s**
750 **[+]**	**853.00**	**750.00+**
115 **[+]**	**958.00**	**115.00+**
[Total]	**958.00**	**(4 items) Total 958.00t**
Quarter Total		
[GT]	**2,896.00**	**2,896.00g**

See Also: 10-key calculator

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Memory Functions

The memory features on the 10-key, function as the equivalent of an adding machine inside an adding machine. They are perfect for times when you need to make intermediate non-related calculations while using the 10-key calculator. You can use the memory buttons (**[MT]**, **[MS]**, **[M+]**, and **[M-]**) to store one result while calculating another. If you create a new tape, the tape is clear, or you have selected **[AC]**, the memory running total will be set to zero.

Example: You work as a staff accountant for a local CPA firm, and are in the process of adding several numbers (12.28, 22.89, 163.55, 92.25, 117.35, 62.41) when a co-worker walks into your office. This co-worker suddenly requests that you add a new list of numbers together (296.16, 23.37, 32.92). You know you can add your co-worker's numbers using **PentaCalc Pro**'s memory function, thus preventing you from having to reenter the numbers you were adding before your co-worker walked in.

Part 1: Begin adding the list of numbers.

Enter	Display	Tape Display
12.28 **[+]**	**12.28**	**12.28+**
22.89 **[+]**	**35.17**	**22.89+**
163.55 **[+]**	**192.72**	**163.55+**

Part 2: Add your co-workers numbers.

296.16 **[M+]**	**296.16**	**296.16M+**
23.37 **[M+]**	**23.37**	**23.37M+**
32.92 **[M+]**	**32.92**	**32.92M+**
[MT]	**352.45**	**352.45MT**

Part 3: Complete adding your list of number.

92.25 **[+]**	**290.97**	**92.25**
117.35 **[+]**	**408.32**	**117.35**
62.41 **[+]**	**470.72**	**62.41**

Example: This example shows how **[M+]**, and **[M-]** are used. You need to purchase the following: 5 items at $12.37, 3 items at $8.62, and 9 items at $4.75. At the end of the calculation, you change your mind, and decide not to purchase the last 9 items at $4.75 each.

Solution: You decide to use the memory for this calculation because you do not want to disturb a current calculation in the independent add register.

Enter	Display	Tape Display
[MT]	**0.00**	**00.00MT**
5 **[x]** 12.37 **[M+]**	**61.85**	**6.00X**
		12.37=
		61.85
		61.85M+
3 [x] 8.62 **[M+]**	**25.86**	**3.00X**
		8.62=
		25.86
		25.86M+
9 [x] 4.75 **[M+]**	**42.75**	**9.00X**
		4.75=
		42.75

		42.75M+
[MS]	**130.46**	**130.46MS**
9 **[x]** 4.75 **[M-]**	**42.75**	**9.00X** **4.75=** **42.75** **42.75M-**
[MT]	**87.71**	**87.71MT**

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Calculating Percentages (10-key)

Example: Calculate the add-on percentage, $1,450 + 15%

Enter	Display	Tape Display
1450 **[x]** 15 **[%+]**	**1,667.50**	**1,450.00x** **15.00%+** **217.50=** **1,667.50**

Example: Calculate the discount percentage, $69.00 - 10%

Enter	Display	Tape Display
69 [x] 10 [%-]	**69.00**	**69.00x** **10.00%-** **6.90=** **62.10**

See Also: 10-key calculator

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Calculating Tax

You may store a tax rate by entering the new tax rate as a percentage, and pressing **[Tax Rate].** The rate will be stored until a new tax rate is entered. To look at the current tax rate, press **[Tax Rate]**, and the tax rate will be displayed in the entry display. Tax is computed on the current running total.

To calculate tax, press **[Tax]**. The amount of tax is displayed on the tape, but then you must press either **[+]** or **[-]** to have it added to or subtracted from the current running total. You may also calculate tax on only one item in a list. This is illustrated in the first example below. The default tax rate is 6.25%.

Example: You have purchased two items for $859.35, and $28.49. The tax rate will be 7.29%. You only need to compute tax on the $859.35 item. What will be the tax amount and the total purchase price?

Enter	Display	Tape Display
7.29 **[Tax Rate]**	**0.00**	**7.29Tax Rate**
28.49 **[+]**	**28.49**	**28.49+**
859.35 **[+]**	**887.84**	**859.35+**
858.35 **[Tax][+]**	**950.49**	**859.35tax**
		62.65
		62.65+

Example: You have purchased three items for $1.38, $2.59, and $9.99. The tax rate will be 8.25%. What will be the tax amount and the total purchase price?

Enter	Display	Tape Display
8.25 **[Tax Rate]**	**0.00**	**8.25Tax Rate**
1.38 **[+]**	**1.38**	**1.38+**
2.59 **[+]**	**3.97**	**2.59+**
9.99 **[+]**	**13.96**	**9.99+**
[Tax][+]	**15.11**	**13.96tax**
		1.15
		1.15+

See Also: 10-key calculator

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Calculating Gross Profit Margins

The terms markup and margin are often confused. **Markup** refers to the profit resellers make as a function of the dollars added to the price they pay for the product. **Margin** refers to the profit dollars as a function of the price the customer pays for the product. **[GPM]** calculates the margin as a function of the selling price.

Example: To calculate the gross profit margin:

1. Enter the cost of the item.
2. Press **[GPM].**
3. Enter the profit (or loss) margin. Be sure to enter a loss margin as a negative value.
4. Press **[=]**.

An item cost you $31.00 and you would like to earn 35% profit margin when selling the item. Calculate the selling price.

Enter	Display	Tape Display
31 **[GPM]** 35 **[=]**	**47.69**	**31.00GPM** **35.00%** **16.69P/L** **47.69Sell**

See Also: 10-key calculator

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Viewing a Graph

The graph window consists of a Cartesian coordinate system, with the horizontal line representing the independent variable x, and the vertical line representing the dependent variable. The tick marks on both axes represent variable intervals, depending on what scale factor you have selected. Once a graph is created, you can zoom in and out, resize and rescale, print, or copy it to the clipboard.

Scaling

There are two methods of scaling a graph:

- Use the **[Scale_+]** and **[Scale_-]** button to zoom in and out on the graph.

  -OR-

- Use **[Xmin]**, **[Xmax]**, **[Ymin]** and **[Ymax]** to specify the maximum and minimum values of x and y you want to appear on the graph.

Sizing

It is possible to resize the graph by using standard Windows conventions for resizing a window. Changing the size of the window only affects how much of the graph you are able to view; it will not change the scale of the graph.

See Also: Graphing Calculator, Creating a Graph

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Locking/Unlocking a Button

The **Locked** feature is recommended for buttons that will rarely be changed. It is possible to unlock or re-lock a button at any time. Locking a button will prevent you from inadvertently changing its function. We recommend that storage buttons be left unlocked, since the purpose will be to frequently enter new information in the button. If you decide you would like to change the function or contents of a "locked" button, follow these steps:

1. Bring up the Button Properties dialog box for the button you would like to modify.
2. Deselect the **Locked** option and click **[OK]**.
3. Store the new number or operator in the button. See Also...
4. If you would like to re-lock the button, bring Button Properties up again, select the **Locked** option and click **[OK]**.

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Using Operator Buttons

An operator button is used to automate a task you may perform quite often. You may want to think of it as performing some of the same functions as a "macro" on other computer applications, with some unique twists. An operator may contain a combination of numbers entered directly, number buttons, unit buttons, or other operators such as +, -, x or %. In fact, you may use operator buttons within an operator button.

- Creating Operator Buttons
- Editing Operator Buttons
- Practice Using Operator Buttons

Top

Creating Operator Buttons

To create and use an operator button, follow these steps:

1. From the **File** menu, select **New Button...**

   The Button Properties dialog box will appear.
2. In the **Title** edit box, enter the name of the button.
3. Using your mouse, click on **Operator.**

   This will indicate to **PentaCalc Pro** that you want to create an operator button.
4. Select **[OK].**

   The cursor will become the outline of a button.
5. Use the cursor to position the button where you want it on a calculator, and click the left mouse button.

   The button will now be a part of the calculator.
6. Once you have created the new button, you may create an operator by delimiting the operation with **[{ }]**.
7. To store the operation press, **[Sto]** followed by the newly created button.

   This will store the operator "in" the button.
8. If you want to prevent yourself from accidentally altering your operator button, you may want to lock the button by selecting **Button Properties**... from the **File** menu, and selecting the **Locked** option. If **Locked** is checked and you desire to edit the contents of the button, you must first unlock the button.
9. To perform the operation, press the newly created button at the appropriate point in your calculation.

Example: Create a button called "New Operator" which will add 375 **[TM]** 24 to the number in the display. Enter 45 in the display and add it to the contents of **[New Operator].**

Solution: Clear some space on any calculator for **[New Operator].**

You can assign the function by using **[{ }]** to signify the start of the operation and **[{ }]** to signify the end.

Enter	Display
[{ }] [+] 375 **[TM]** 24 **[=] [{ }] [Sto] [New Operator]**	0
45 **[New Operator]**	60.63

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Editing Operator Buttons

After creating your own buttons, it is possible that your more complex operator calculations will not work the first time exactly as you had hoped. If this happens, you may need to find your mistake by debugging the button. To view the contents of an operator button, do the following:

1. Select **[Rcl]** followed by the button you are trying to debug.

   The contents of the button will be displayed on the tape.

2. Edit the operator by marking a section of the tape and deleting it, changing individual numbers, or moving the insertion point and making modifications. After you have completed the editing process, you will need to make sure the insertion point is located below the right curly brace (}). **PentaCalc Pro** will look "up" the tape for the first right curly brace and will store every thing between it and the first left curly brace in the operator button.

3. After you have finished editing your operator button, select **[Sto]** then the button you want to store the modified operator "in".

   The new operation will be saved in the button.

See Also: Creating a Button.

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Practice Using Operator Buttons

Example: How Deep are the wells.

Part 1:
You work for Water Well, Inc. and you have been given the assignment to determine the depth of one hundred water wells. You decide to hire someone to drop a rock in each well and time how long it takes to hear the splash. Galileo has determined that the acceleration of objects in a free fall is a constant if you neglect air resistance. The formula for the acceleration of gravity (g) is as follows:

g = 32.2 ft/s»

Once you know g and the time it takes to hear the splash t, you can calculate the depth of the well distance with the following formula.

dist = (gt») / 2

You want to be able to enter the time of the fall in seconds then press an operator button called **[DISTANCE],** and have **PentaCalc Pro** calculate the distance in feet. You may want to create room for your new button by extending one of the sides on the standard calculator or possibly create your own calculator with the name "Wells". Next create an operator button and create a button called **[DISTANCE]**.

We won't bother to run through the steps to calculate the depth of all one hundred wells. However, we will calculate the depths of the first four wells in the following example. The time in seconds for the rock to hit the water in the first four wells were as follows: 2.8, 1.7, 3.5, and 2.24.

Enter	**Display**
[{ }] [x»] [˜] 32.2	32.2
[™] 2 **[=] [{ }]**	2
[Sto] [Distance]	0
2.8 **[Distance]**	126.22
1.7 **[Distance]**	46.53
3.5 **[Distance]**	197.23
2.24 **[Distance]**	80.78

Part 2: Create an operator button which holds a variation of the above equation. You discover your rock dropper is more of a rock thrower; and the rocks all started with an initial velocity of 4 feet per second. You will need to alter your previous equation to reflect the change made for initial velocity, (vÃ).

dist = (gt») / 2 + vÃt

First, create the following two new number buttons: **[INT VELOCITY]** and **[Time].** The **[Time]** button will be used temporarily during the distance calculations. Notice in the keystrokes below that the fall time is stored in **[Time]** so it may be used later in the calculation. After the distance operation is stored in **[DISTANCE]** and the initial velocity of 4 feet per second is stored, we will calculate the distance for the four times of 2.8, 1.7, 3.5 and 2.24 seconds.

The complete keystrokes for solving the second part of this problem are located below.

Enter	**Display**
[{ }] [Sto] [Time] [Time] [x»] [˜] 32.2	**32.2**
[™] 2 **[+] [Time]** [˜]	**Time**
[INT_VELOCITY] [=] [{_}]	**Int Velocity**
[Sto] [DISTANCE]	**0.00**

4 **[INT VELOCITY]**	**0.00**
2.8 **[DISTANCE]**	**137.42**
1.7 **[DISTANCE]**	**53.33**
3.5 **[DISTANCE]**	**211.23**
2.24 **[DISTANCE]**	**89.74**

See Also: Creating an Operator Button

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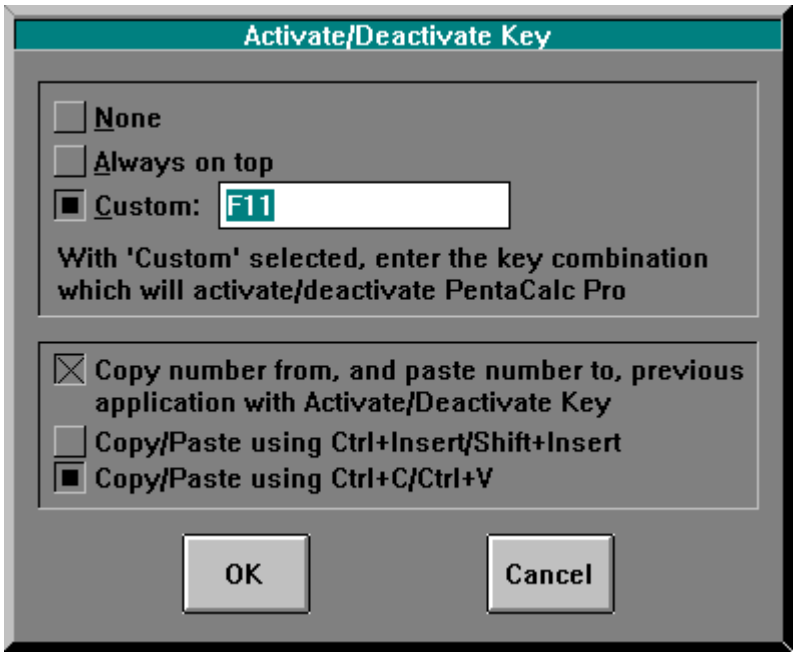
Activate / Deactivate Dialog

Click on the part of the calculator where the appears for a brief description.



See Also: Using the Keyboard

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Button Text Colors Dialog

Each kind of button (Numbers, Operators, Units, and other text) can be set to one of the colors shown above each button. Click on the color to set that color for the respective button.

See Also: Changing Button Text Colors

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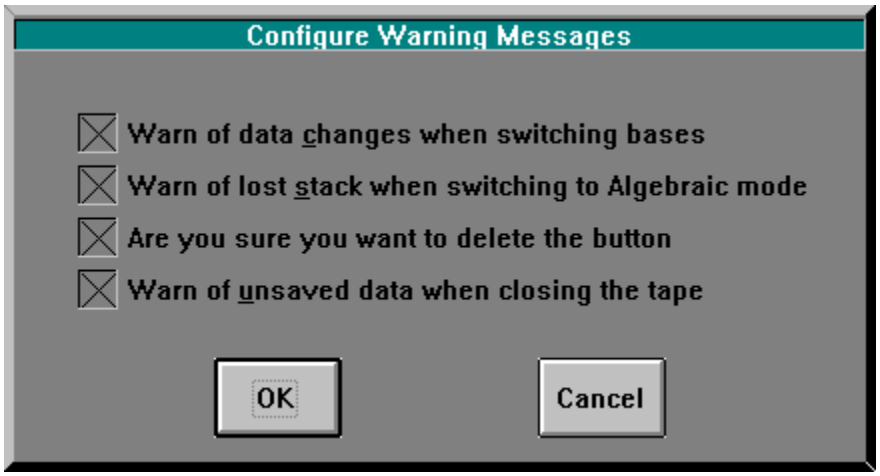
Configure Warning Messages Dialog

Click on the part of the dialog where the appears for a brief description.


Configure Warning Messages
Warn of data changes when switching bases
Warn of lost stack when switching to Algebraic mode
Are you sure you want to delete the button
Warn of unsaved data when closing the tape
OK
Cancel

See Also: Setting Warning Messages.

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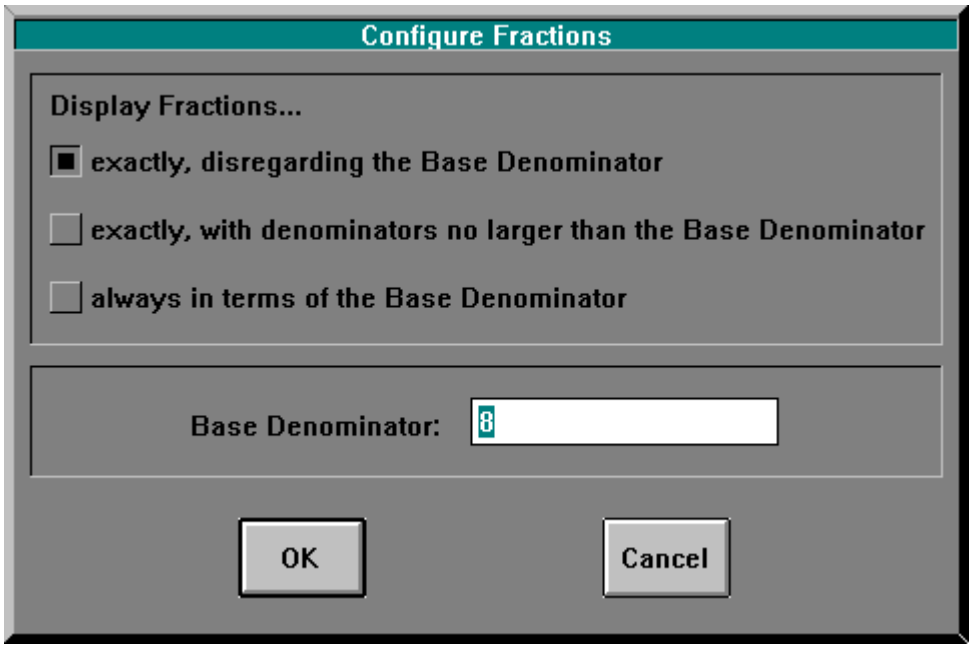
Configure Fractions Dialog

Click on the part of the dialog where the appears for a brief description.



See Also: Using Fractions.

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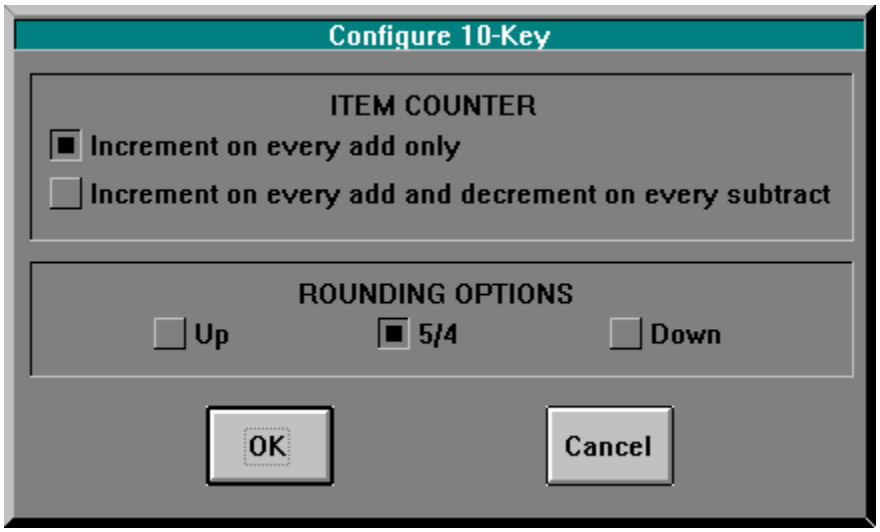
Configure 10-key Dialog

Click on the part of the calculator where the appears for a brief description.



See Also: 10-key calculator

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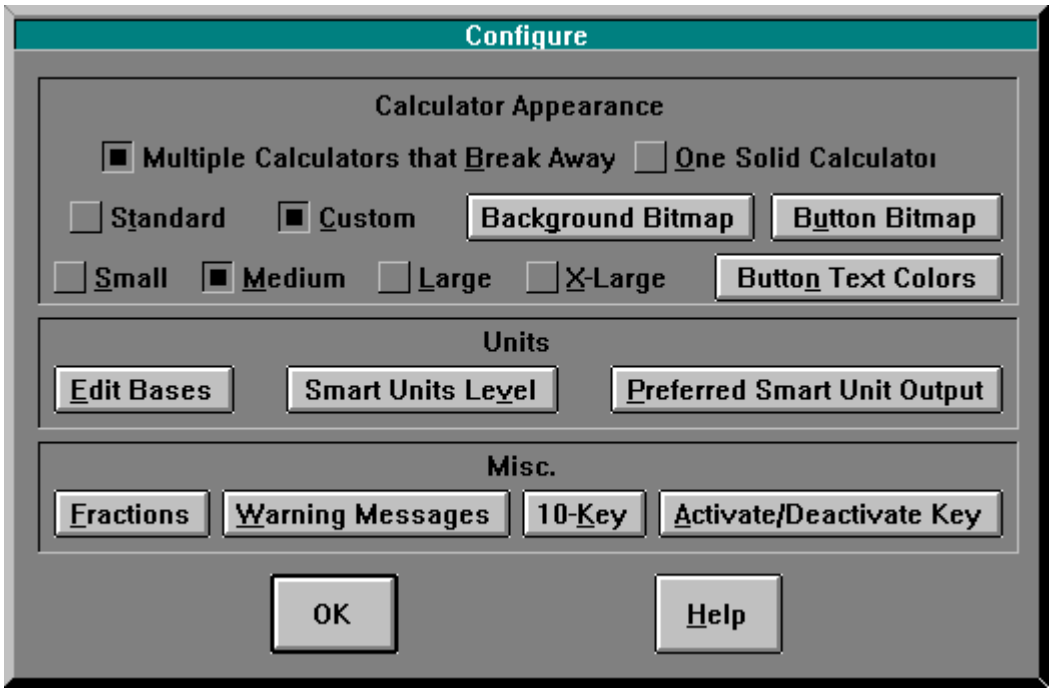
Configure Dialog

Click on the part of the dialog where the appears for a brief description.



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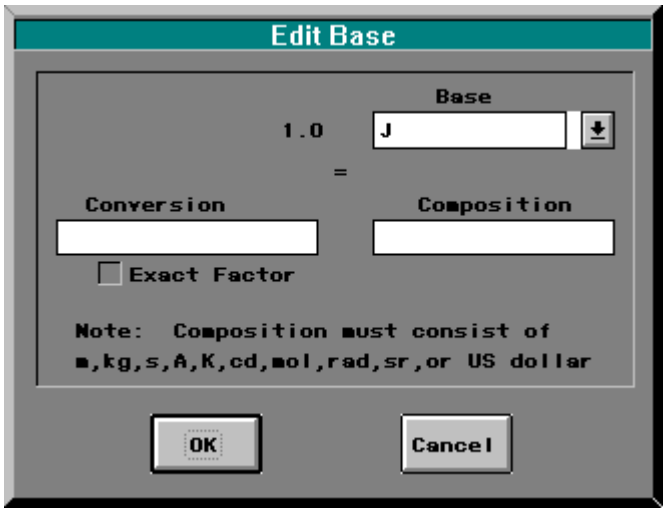
Edit Base Dialog

Click on the part of the dialog where the appears for a brief description.



See Also: Unit Conversions

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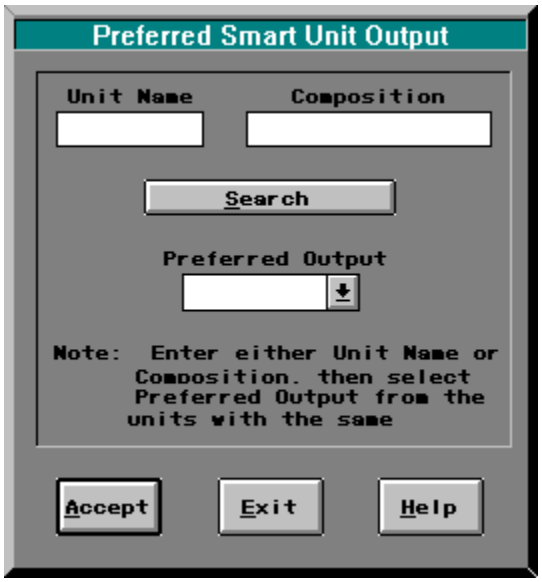
Preferred Smart Unit Output Dialog

Click on the part of the dialog where the appears for a brief description.



See Also: Configuring Smart Units, Creating Units, Unit Composition

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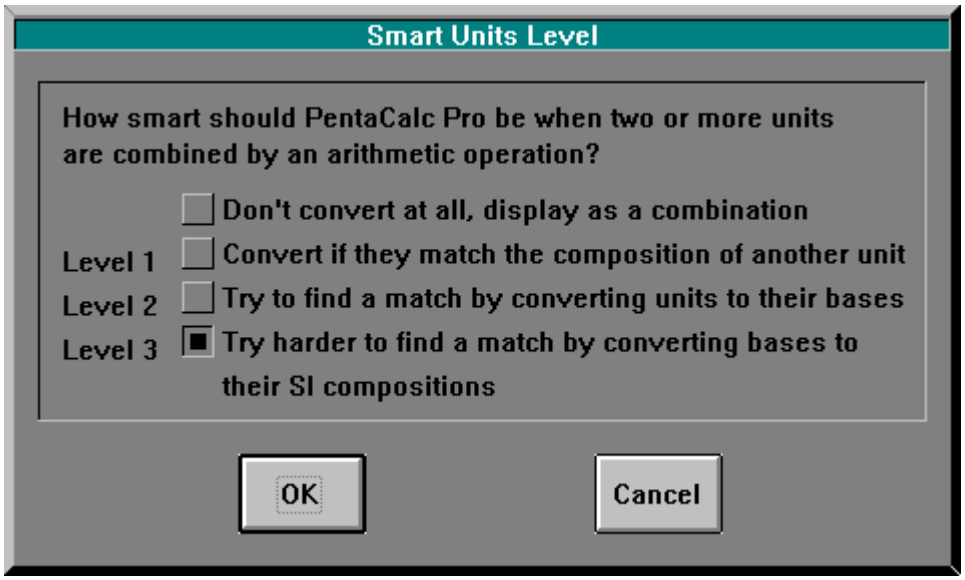
Smart Units Level Dialog

Click on the part of the dialog where the appears for a brief description.


Smart Units Level
How smart should PentaCalc Pro be when two or more units are combined by an arithmetic operation?
Don't convert at all, display as a combination
Level 1
Convert if they match the composition of another unit
Level 2
Try to find a match by converting units to their bases
Level 3
Try harder to find a match by converting bases to their SI compositions
OK
Cancel

See Also: Unit Conversions, Configuring Smart Units

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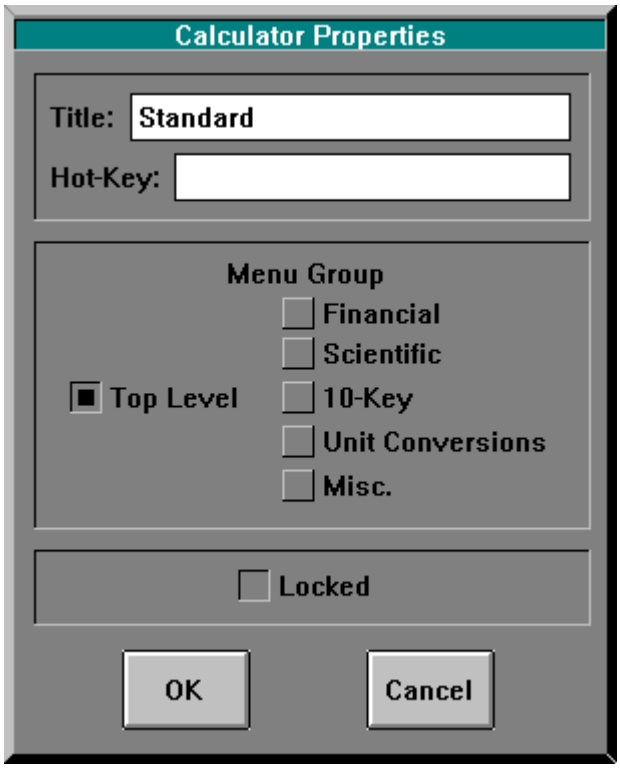
Calculator Properties Dialog

Click on the part of the dialog where the appears for a brief description.



See Also: Creating a Calculator, Creating Custom Calculators, Button Properties, Button Properties (Units)

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List of Calculators

Calculator	Features
Programming	• Quickly switch between binary, octal, decimal, and hexadecimal bases. • Works in bit sizes 8, 16, and 32. • Does all basic math functions with signed or unsigned numbers. • Perform the following logical operations: AND, OR, NOT, and XOR. • Includes modulus, sign extend, reverse, swap, shifting (signed and unsigned), rotating (with and without carry).
Scientific	• Has all trigonometric, hyperbolic, exponential, and logarithmic functions • Includes Pi, factorial, rectangular-polar conversions, degrees, radians and grads. • Performs all basic arithmetic operations and most advanced scientific operations, such as sine and cosine of complex numbers. • Performs several special operations on complex numbers such as: real part, imaginary part, conjugate, absolute (modulus or magnitude), argument and sign.
Time Value of Money	• Can generate, print or save an amortization table. • Calculate all time value of money problems involving compound interest calculations such as: savings accounts, mortgages, pension funds, leases, and annuities. • Includes amortization calculations for determining the amounts applied toward principal and interest in a payment or series of payments.
Cash Flow	• Analyze cash flows of uneven amounts that occur at regular intervals. • Calculate internal rate of return (IRR%), net present value (NPV), net uniform series (NUS), and net future value (NFV).
Bond	• Calculates the yield to maturity, price, yield to call, accrued interest and duration of a bond. • You can specify the calender basis between 30/360, actual/actual (days per month/days per year) or Actual/360. • You can also specify the coupon payments as semiannual or annual.
Depreciation	• Calculates a full depreciation table using declining balance, sum-of-the-years'-digits and straight line methods.
Business	• Calculates interest rate conversions between nominal and effective interest rates using either periodic or continuous compounding. • Calculates percent change, percent total, markup as a percent of cost, and markup as a percent of price.
Statistics	• Calculates mean, median, total, standard deviation, min, max, sort and range for both

one and two variable statistics.

- Calculates sum of x and y squared, and the sum of the of xy.
- Calculates standard error of the mean and linear regression analysis.

Unit Conversions

- Converts between hundreds of units including currency, length, mass, temperature, momentum, and over forty other unit types.
- Use Smart Units to help you perform dimensional analysis.
- You can even create your own units.

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Loading a Custom Calculator

When you build a custom calculator with **PentaCalc Pro**, all of the information integral to the operation of that calculator is automatically saved to a file using the first eight letters of the calculator name with a **.cal** extension. (If the first eight letters are the same as another calculator, then the seventh and eighth digits will be replaced with a number.) Once a calculator is created, it is saved to the PCALCPRO directory, or to the directory in which **PentaCalc Pro** is stored.

To load a calculator:

1. Choose **Import Calculator...** from the **File** menu.
   The "Open" dialog box will appear.
2. To see a list of files of a particular type, select the type of file you want from the File type drop-down box. **PentaCalc Pro** can only load a file with the .cal extension.
3. Enter the filename, including the complete path, into the File Name text box -or- select the file name from the drive, tree, and file list boxes.
4. Select **[OK].**
   The Calculator Properties dialog box will appear.
5. You may change the title, hot-key, menu group or locked status for the new calculator.
6. Select **[OK]**. The new calculator will appear in the Calc menu.

See Also: Creating a Calculator

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Interface Overview

PentaCalc Pro is made up of two basic components:

- The tape display interface, which has the appearance of the display on a handheld calculator.
- Calculator interfaces, which have the appearance of the keyboard on a handheld calculator.

Any **PentaCalc Pro** interface is both resizable and scalable. Interfaces can be attached to each other by dragging the edge of one interface close to the edge of another. The interfaces will have a tendency to "snap" together and may be joined anywhere on a horizontal or vertical edge. Once two or more interfaces are attached, they may be moved as an entire unit by moving the interface that is highest on the screen and if they are the same height, the left most interface will have movement control. The best way to learn how this works is to move several interfaces around on the screen and experiment with how they interact with each other.

See Also: Calculator Appearance

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About the Tape

If you are in RPN notation, the entry display is no longer fixed to one line in height and it takes on the additional task of serving as the stack. The RPN entry display/stack may be resized and has a vertical scroll bar.

The display interface may be stretched as wide or as tall as you can fit on your screen. In fact, the tape interface is the only interface that is required to be on the screen in order to keep **PentaCalc Pro** running. You may close down all the calculators and control **PentaCalc Pro** completely from the keyboard with a small tape interface on your screen. When resizing the display interface, the tape display will expand or contract in the vertical or horizontal direction. The entry display is not resizable in height (unless you are in RPN mode), but will expand or contract horizontally. If you wish to change the vertical size of the tape display, the control points are the bottom, top or corners of the entry display.

See Also: Using the Tape Display

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Creating a New Tape

1. Select New Tape from the File menu. One of the following will happen:

   If you have not made changes to the tape, a new tape will be created and you may continue making calculations.

   If you made changes to the tape a dialog box will appear asking if you want to save the current tape and you will move to step 2.

2. Select a response.

   If you select **[No]**, all current calculations on the tape will be erased and a new tape will start.

   If you select **[Yes]**, the "Save as" dialog box will appear.

3. Enter the tape filename, including the complete path, into the file text box -OR- select the file name from the drive, tree, and file list boxes.

4. Select **[OK]**.

See Also: Tape Overview.

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Opening the Tape

To open a tape:

1. Choose **Open Tape...** from the **File** menu.

   The "Open" dialog box appears.

2. Enter the tape filename into the file text box

   -or-

   Use the drive, tree, and file list boxes to select the tape filename. Any entries on the existing tape will be lost.

3. Select **[OK]**.

See Also: Tape Overview.

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Saving the Tape

Saving the tape as a new file

1. Select **Save As...** from the **File** menu.

   The "Save as" dialog box will appear.

2. Enter the tape filename, including the complete path, into the file text box -or- select the file name from the drive, tree, and file list boxes.

3. Select **[OK]**.

Saving changes to a tape file

Select **Save Tape** from the **File** menu. The tape will be saved with the new changes to the current name. If no name has been selected, the "Save As" dialog box will appear.

See Also: Tape Overview.

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Printing the Tape

To print the current tape:

1. Choose **Print Tape...** from the **File** menu.

   The "Print" dialog box will appear, showing a combo box with the default printer selected.
2. To print to a printer other than the one currently displayed, select the drop down button and then select the new printer.
3. To change various configurations on the current printer such as the number of copies and landscape or portrait format, select the **[Setup]** button.
4. When you have selected the printer and setup, or if the current settings were already what you want, select **[OK]**.

See Also: Tape Overview.

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Resizing the Interface

PentaCalc Pro has almost infinite flexibility with its ability to be resized to any dimension. You may resize **PentaCalc Pro** by using standard Windows window resizing conventions, i.e. the cursor changes to a two-headed arrow.

It is possible to enlarge the dimensions of a calculator to expose an area without buttons, making it easy to add your own. You may also desire to resize the calculator to "hide" buttons you don't use very often in order to conserve screen space.

See Also: Changing the Scale, Tape Overview.

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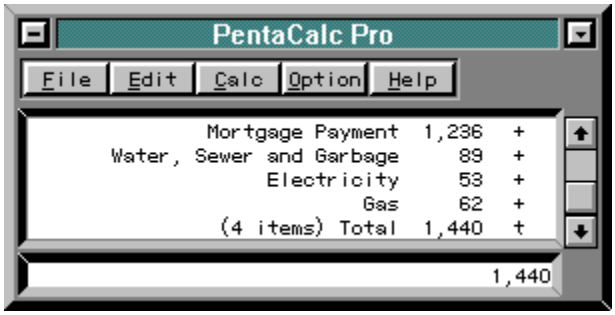
Using the Tape Display

Click on the part of the calculator where the appears for a brief description or read below the calculator for detailed information.



PentaCalc Pro includes a running tape that displays a record of your calculations regardless of what mode you are in. When a new tape is created or **PentaCalc Pro** is started, the tape will show the current default settings for such options as base, angle mode, operating logic, and display format.

The tape not only keeps a record of what numbers and operators you have entered, but any status changes you make as well. For example, if you change to 10-key notation in the middle of a tape, the tape will display 10-key Notation on the tape at the point the change was made. This provides the benefit of always having a record of where you have been. If you suddenly discover you made a mistake 25 lines up you can simply scroll up the tape, make your change and the tape will recalculate.

By setting a new insertion point, you may make calculations from any point in the tape. You can also make memo notations next to any entry so you will be able to remember what that calculation was for. The tape display may also be printed, and saved as a file.

See Also: Tape Overview.

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Adding Memos

The comment field is where you can add text memos to your numerical entries. This is very helpful when you have a lot of entries on the tape and you need a convenient method of keeping track of them. To add a memo to the comment field:

1. Click to the left side of the tape display on the same line where you would like to make your comment.
2. The "I" beam cursor will appear in the field where text may be entered. You may enter any alphanumeric character.
3. To terminate the text entry, just click on another part of the calculator

   -OR-

   press enter on your computer keyboard.

See Also: Tape Overview.

Comments Field
This field (the left field) is for comments (or memos). See Adding Memos.

Numbers Field
This field (the middle field) is for numbers. See Entering Numbers

Operators Field
This field (the right field) is for operators. See Also: Creating Operator Buttons.

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Entering Numbers

To practice entering a number in the number field:

1.Key in several digits and, if desired, change the sign by using the change sign button **[±]** .

The width of the number field will grow depending on the size of your largest numerical entry.

2. Follow the number with an operator to move the number onto the tape from the display register.

See Also: Tape Overview.

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Editing Memos

To edit any entry in the comment field, click in the field of the comment you would like to edit and use standard Windows text handling conventions to make changes. You may also add whole-line comments by clicking the **[Line Feed]** button on the 10-key calculator -or- you may select **Line feed** from the **Edit** menu. Then click anywhere on the blank line.

See Also: Tape Overview.

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Editing Numbers

You may edit the numerical entries at any time by clicking in the number field and using standard Windows methods of backspacing, inserting, deleting, cutting, pasting, etc.

The number field is perfect for doing "what if" analysis, such as changing interest rates and recalculating an amortization table. You may terminate your editing session by pressing enter on the keyboard, clicking in another display field or clicking on a **PentaCalc Pro** button. After each change has been made, all affected numbers will be recalculated to reflect your changes.

See Also: Tape Overview.

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Using and Editing the Operator Field

When you select a function, an operator symbol will appear to the right of the numerical display. By changing an operator in the operator field, you can easily recalculate the tape. However, you may only change an operator to another like operator. For example, **+** may be changed to -, or **x** may be changed to **TM**. If you desire to make other changes you must first delete and enter the new line.

To edit an operator:

1. Click on the operator with the mouse to highlight it.
2. Type the new operator in the field.
3. Recalculate the tape by pressing enter on the keyboard, clicking on another field in the tape display or clicking on another **PentaCalc Pro** button.

See Also: Tape Overview.

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Changing the Insertion Point

Normally each number or operator is added to the bottom of the tape. However, you may need to make calculations at another position in the tape instead of this default position. For example, if you are adding a long series of numbers together and decide you would like to go "up" in the tape and insert a subtotal at various locations, you must use the insertion feature to do this.

To change the insertion point:

1. From the Edit menu select Set Insertion Point.

   The cursor will change once you move it to the tape.
2. Click between the entries where you would like the new insertion point to be.
3. Enter numbers and operators the way you normally would.

   All entries will be entered at the new insertion point.
4. To return the insertion point to the bottom of the tape select Restore Insertion Point from the Edit menu or click the right mouse button on the last line of the tape.

-OR-

You may also set a new insertion point by clicking the right mouse button anywhere in the tape. The new insertion point will start directly below the line where you click the right mouse button

See Also: Tape Overview.

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Calculator Appearance

Just for fun, we have included the ability to add different texture bitmaps to **PentaCalc Pro**'s interfaces and buttons. We have included several bitmaps for you to use.

To access the custom calculator background and button textures, select the Custom option. If you select the Standard option, **PentaCalc Pro** will change to its default gray on gray colors. You may modify the text colors in both Custom and Standard modes.

Select from one of the following:

- Background Bitmaps
- Button Bitmaps
- Button Text Colors
- Changing the Size of **PentaCalc Pro**

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Background Bitmaps

To load a new background bitmap:

1. Choose **Configure...** from the **Option** menu.
   The Configure dialog box will appear.
2. Select **[Background Bitmap].**

   The "Open" dialog box will appear with the .bmp extension entered in the List Files of Type box. You will need to open a file with the .bmp extension since this is the only graphic file format **PentaCalc Pro** supports.
3. Enter the file name, including the complete path, into the file text box
   -or-
   Select the file name from the drive, tree, and file list boxes.
4. Select **[OK]**.

The background bitmap will change to the selected bitmap.

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Button Bitmaps

The button bitmap is selected using the same steps as you would for the background bitmap except you select **[Button Bitmap]** in instead of **[Background Bitmap]**.

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Changing Button Text Colors

To change the color of the button text:

1. Choose **Configure...** from the **Option** menu.
   The Configure dialog box will appear.
2. Select **[Button Text Colors]**.
   The "Button Text Colors" dialog box will appear.

You have the option of changing the text on buttons to one of 16 different colors. The four types of buttons follow:

Numbers	consist of number buttons you create, 0-9 on the standard calculator, constants, and memory.
Operators	consist of operator buttons you create and most other buttons on **PentaCalc Pro**.
Units	consist of specific unit buttons you create and every unit button shipped with **PentaCalc Pro**.
Other text	consists of menus, radio buttons (such as **Beg** and **End** options on the time value of money calculator) and the text for entry fields such as Sett and Mat on the bond calculator.

You may click on any color above the four types of buttons to change the color of that button type. To save changes, select **[OK]**.

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Changing the Scale

PentaCalc Pro has four possible sizes to which it may be scaled. This differs from sizing **PentaCalc Pro**. Scaling **PentaCalc Pro** will change the actual size of the entire calculator, including buttons and text. It has the same effect as changing the screen resolution of your monitor. If you have **PentaCalc Pro** set to "Small" scale it will take up a smaller portion of your monitor screen; the opposite of this is true if you select the "X-large" scale.

To set the scale of PentaCalc Pro:

1. Select Configure... from the Option menu.
   The Configure dialog box will appear.
2. Click on the scale you prefer: Small, Medium,Large, or X-Large.

See Also: Tape Overview.

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Other Bases

With **PentaCalc Pro** you can quickly convert between binary, octal, decimal or hexadecimal numbers by selecting the new base you wish to convert to from the **Option** menu. The base you are currently in will be noted by a lower case "b" for binary, "o" for octal, and "h" for hexadecimal at the end of the number. Decimal bases have no letter designator. For more information on conversions between decimal, hexadecimal, octal and binary please see the Programming Calculator.

Example: Convert the hexadecimal number 7FFFFFFF to decimal.

From the **Option** menu, select **Hexadecimal.** *For this example,You must also select 32 bit wordsize on the Programming calculator.*

Enter	Display	Description
7FFFFFFF	**7FFFFFFFh**	**enters hex number**

From the **Option** menu, select **Decimal.** The decimal number 2,147,483,647 will be displayed.

See Also: Standard Calculator, Base Conversion, Feet/Inches Base, Time Bases

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Feet / Inches Base

With the fractions capabilities of **PentaCalc Pro**, you can work with fractional feet/inch measurements at the same time. When you select the Feet/Inches base, the Standard calculator changes as shown below.

The new buttons that appear on the Standard calculator are explained in the following table:

Button	Function
[sq]	Used for making calculations involving square feet or square inches.
[cu]	Used for making calculations involving cubic feet or cubic inches.
[feet]	When selected after a number, will enter that number as feet for the calculation.
[inch]	When selected after a number, will enter that number as inches for the calculation.

Practicing with the Feet/Inches base

To use the Feet/Inches base, select **Feet/Inches** from the **Option** menu. The Standard calculator will change as previously described. Notice in the following examples it isn't necessary to follow **[feet]** with **[inch]** when making calculations that involve feet. **PentaCalc Pro** automatically assumes that any number following **[feet]** is inches. **[inch]** is reserved for calculations involving inches only.

Calculate	Enter	Display
1' 3" + 3' 11"	1 **[feet]** 3 **[+]** 3 **[feet]** 11 **[=]**	5' 2"
3' 3/16" - 7' 7/16"	3 **[feet]** 3 **[']** 16 **[-]** 7 **[feet]** 7 **[']** 16 **[=]**	4' 0 1/4"
3 1/2' + 1 3/4' 2 3/16"	3 **[']** 1 **[']** 2 **[feet]** **[+]** 1 **[']** 3 **[']** 4 **[feet]** 2 **[']** 3 **[']** 16 **[=]**	5' 5 3/16"
3"+7 5/8"	3 **[inch]** **[+]** 7 **[']** 5 **[']** 8 **[inch]** **[=]**	0' 10 5/8"
3.5' ™ 4"	3.5 **[feet]** **[™]** 4 **[inch]** **[=]**	10.5
5' ˜ 9	5 **[feet]** **[˜]** 9 **[=]**	45' 0"
5' ˜ 9'	5 **[feet]** **[˜]** 9 **[feet]** **[=]**	45sq'
25 in2 ˜ 2	25 **[sq]** **[inch]** **[˜]** 2 **[=]**	50sq"
25 in2 ˜ 2'	25 **[sq]** **[inch]** **[˜]** 2 **[feet]** **[=]**	600cu"
39 in3 ™ 7	39 **[cu]** **[inch]** **[™]** 7 **[=]**	5.57142857142857cu"
39 in3 ™ 7'	39 **[cu]** **[inch]** **[™]** 7 **[feet]** **[=]**	0.464285714285714sq"

With **PentaCalc Pro** you may also quickly convert between square or cubic feet and inches.

Example: Calculate 50 ft» x 2 then convert to square inches.

Enter	Display
50 **[sq]** **[feet]** **[˜]** 2 **[=]**	**100 sq'**
[inch]	**14400 sq"**

See Also: Standard Calculator, Base Conversion, Other Bases, Time Bases

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Time Bases

PentaCalc Pro allows calculations in two different time bases:

Base	Explanation
H:M:S	Where you can perform calculations between hours, minutes, and seconds.
Dates	Where you can calculate days between dates, or find out what day of the week your birthday will fall on next year

To work in the Hours-Minutes-Seconds base:

1. From the **Option** menu select **Hours-Minutes-Seconds**.

   [.] will change to a colon **[:]** button to facilitate entry of this type of number.

2. Perform calculations.

While in the **Hours-Minutes-Seconds** mode you must enter time in the H:M:S format. However, you may enter more than 60 seconds or minutes and **PentaCalc Pro** will automatically reformat for you. For example, if you enter 100 seconds it will reformat to 1 minute 40 seconds (1:40) when an operation is performed on the number. The H:M:S base may also be used for Degrees:Minutes:Seconds calculations.

Example: Add 4 hours 23 seconds to 3 hours 75 minutes 106 seconds.

From the Option menu select Hours-Minutes-Seconds. You may execute **[:]** by pressing the decimal point or period on your computer keyboard. The decimal point automatically changes on the keyboard when you change to the Hours-Minutes-Seconds base.

Enter	Display	Description
[AC]	**00:00:00**	clears display
4 **[:]** 0 **[:]** 23 **[+]**	**04:00:23**	enters time
3 **[:]** 75 **[:]** 106 **[=]**	**08:17:09**	displays result

To work in the Dates base:

1. From the **Option** menu, select **Dates**.

   [.] will change to **[/].**

2. Perform calculations.

Note: You must enter dates in the MM/DD/YYYY format. The MM/DD/YY convention may be used if you are performing calculations in the last 50 years of the 20th Century or the first 50 years of the 21st Century. For example 10/15/50 would be interpreted as 10/15/1950 and 10/15/49 would be interpreted as 10/15/2049.

To separate dates, use the period or decimal point key on the computer keyboard or **[/]** on **PentaCalc Pro**'s keyboard **[/]** is located where the decimal point button used to be. It is not necessary to lead each field with a zero.

For example, to enter January 3, 1675 press 1 **[/]** 3 **[/]** 1675. Only dates between January 1, 1600 and December 31, 9999 are valid because of the lack of standardization prior to 1600.

Example: Make several calculations involving dates.

Part 1: Find what day of the week your birthday will be on in 1995. Your birthday is September 23.

Part 2: Add 42 days to your birthday to find what day of the week your friend's birthday will be. Your friend was born 42 days after you.

Part 3: Calculate how many days between your friend's birthday and Christmas 1995.

From the Option menu select the Dates base. The decimal point button will change to a slash to facilitate entry of this type of number. Select **[AC]** to clear the display.

Enter	**Display**
Solution: Part 1	
9 **[/]** 23 **[/]** 95 **[=]**	Sat, Sep. 23, 1995
Solution: Part 2	
[+] 42 **[=]**	Sat, Nov 4, 1995
Solution: Part 3	
[-] 12 **[/]** 25 **[/]** 95 **[=]**	-51

The number -51 appears as a negative because you have subtracted a larger number (12/25/1995) from a smaller number (11/14/1995).

See Also: Standard Calculator, Base Conversion, Feet/Inches Base, Other Bases

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Algebraic Notation

Algebraic notation is activated by selecting **Algebraic** from the **Option** menu. With Algebraic notation the operator always comes between the two numbers and the operation is always followed by the equal sign.

Example: Calculate 2+2

Enter:	**Display**
2 **[+]** 2 **[=]**	**4**

Using Parentheses with Algebraic Notation

Algebraic notation also makes use of the parentheses buttons. Parentheses are used when you want **PentaCalc Pro** to postpone calculating until you've finished entering numbers and operators.

Example: Calculate 26 / (13 - 7) ˜ 12

If you were to enter 26 **[TM]** 13 **[-]** 7, **PentaCalc Pro** would calculate the intermediate result, -5. To delay the division until the subtraction is complete, use parentheses:

Enter	**Display**
26 **[TM]** **[(]** 13 **[-]** 7 **[)]** **[x]** 12 **[=]**	**52**

See Also: 10-key Notation, RPN

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Reverse Polish Notation (RPN)

Reverse Polish Notation dictates that the operators be specified after the numbers or variables. The purpose of this rearrangement of operators is to make digital computation much more efficient. Except for this section, all examples in the manual are written using Algebraic logic. RPN logic only affects binary operations such as addition, subtraction, division, multiplication, and exponential functions. Unary operations work the same in Algebraic, RPN, and 10-key notations.

Practicing RPN calculations

Using RPN logic, try a few example calculations. You must first select RPN from the Option menu. When you select RPN mode, the **[=]** button turns into **[ENTER].** You do not need to use **[ENTER]** before an operator, only between keyed in numbers. Key in both numbers (separated by **[ENTER]**) before pressing the operator button.

Calculate	Enter	Display
5 + 10	5 **[ENTER]** 10 **[+]**	15.00
10 - 3	10 **[ENTER]** 3 **[-]**	7.00
10 ˜ 5	10 **[ENTER]** 5 **[˜]**	50.00
12 ™ 3	12 **[ENTER]** 3 **[™]**	4.00
10»	10 **[X»]**	100.00
„10	10 **[„]**	3.16
10¼	10 **[ENTER]** 3 **[y•]**	100.00

Using the Stack

When **PentaCalc Pro** is in RPN mode, it uses an automatic memory stack. The memory stack consists of many storage locations, called registers. The number of registers is limited only by the amount of available RAM in your computer; therefore, it is doubtful you will ever run out of registers. The registers are arranged in such a manner that the numbers move up and down the stack sequentially. The most "recent" number is in the R1 register. This is the bottom number in the display. R1... Rx are listed vertically from the bottom. The vertical scroll bars let you review the contents of the stack by shifting the contents upward or downward.

Another feature of RPN mode is the ability to use **[SWAP].** Selecting this button will exchange the contents of the R1 and R2 registers without affecting the rest of the stack. **[SWAP]** is used primarily to exchange the order of numbers in a calculation.

Example: calculate 5 ™ (3 ˜ 7)

Enter	Display
3 **[ENTER]** 7 **[˜]** 5 **[SWAP] [™]**	**0.24**

Clearing the RPN display

Selecting **[DROP]** will eliminate the value in the R1 register and shift all other registers down one. In other words R1, will take on the value of R2, R2 will take on the value of R3, and so forth. In RPN, you will use **[DROP]** until all registers are cleared or press **[AC]** to clear the stack and all other registers (such as those found in the time value of money calculator).

Chain calculations using RPN

The automatic lifting and dropping of the stack's contents let you retain intermediate results without storing or reentering them, and without using parentheses. This is an advantage the RPN stack has over algebraic calculator logic. Other features of RPN include the following:

- You never work with more than two numbers at a time.

- **[ENTER]** separates two numbers which are entered sequentially.
- Selecting an operator key executes that operation immediately.

  Intermediate results appear as they are calculated, so you can check each step as you go.
- Intermediate results are automatically stored. They reappear automatically as they are needed for the calculation-the last result is the first to come back out.
- You can calculate in the same order as you would with pencil and paper, meaning from the innermost parentheses outward.

Example: Calculate 9 TM (10 + (5 ˜ 2) - 2)

Enter	**Display**
5 **[ENTER]** 2 **[˜]** 10 **[+]** 2 **[-]** 9 **[SWAP]** **[TM]**	**0.50**

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10-key Notation

The 10-key mode is designed to be used with the keypad at the right of most desktop keyboards. In order for the numeric keypad to work, numlock must be on. numlock will be turned on automatically when **PentaCalc Pro** is activated. When **PentaCalc Pro** is deactivated, numlock will be returned to its original state. Entries are displayed in floating point mode until you terminate the entry by an operator or function key, then the number is displayed in the current decimal setting. If the number entered has more decimal places than the current setting, it is rounded in the display and on the tape. However, the full number is shown on the tape, stored internally and will be used in all operations. For a detailed description, please see 10-Key.

Entering Numbers and Operators

The 10-key mode has some characteristics similar to both RPN and Algebraic notation, and is designed to function exactly like a Tape/10-key adding machine. The display consists of two sections:

The entry display, which is analogous to the electronic display on an adding machine. The entry display is where data is entered and a running total is displayed. A normal entry consists of a number and an operator. After each numerical entry is completed, selecting one of the operator or function buttons such as **[+]**, **[=]**, or **[Total]** will scroll the entry up on the tape and the entry display will show the running total.

The tape display, which is analogous to the paper tape on an adding machine. The tape display shows a record of every calculation or mode change previously made.

Terminating Data Entries

Addition and subtraction entries are automatically terminated when you press the addition and subtraction buttons. Multiplication and division calculations can be terminated one of two ways:

- Use the **[=]** button to keep the results separate from the independent add register.
- Use the addition or subtraction button to add or subtract the results from the independent add register.

You may total entries by selecting **[Sub]** for subtotal, **[Total]** for total and, **[GT]** for grand total.

Button	Function
[Sub]	Will print a subtotal of the running total and annotate it with an item count.
[Total]	Will print a total of the tape, annotate it with an item count, and start the independent add register over at zero.
[GT]	Will compute a total of all previous totals, not including the current running total.

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Using PentaCalc with Any Windows Application

With **PentaCalc Pro** it is possible to specify what hot-key or hot-key combination will bring **PentaCalc Pro** to the top of your desktop. This option is also used to set up the Quick Copy/Paste feature. To set the Activate/Deactivate key:

1. Select **Configure...** from the **Option** menu.

   The Configure dialog box will appear.

2. Click **[Activate/Deactivate Key]**.

   The Activate/Deactivate Key dialog box will appear.

3. Select one of the following options.

   None. No hot key will be specified.

   Always on top. Whenever **PentaCalc Pro** is running it will stay on top of any application(s) you are running.

   Custom. The default hot-key is **F11**; however, you may select any combination of keys by entering them in this field.

4. If you chose to have a Custom hot-key, you may also select and use the last section:

   Copy number from, and paste number to, previous application with Activate/Deactivate key. If this option is selected, you will be able to copy highlighted numbers from a previous application into **PentaCalc Pro**'s display when you select the Activate/Deactivate hot-key, you will also be able to copy a number from **PentaCalc Pro**'s display and paste it directly to your previous application.

5. Select a Copy/Paste standard.

PentaCalc Pro's Quick Copy/Paste function relies on other Windows application's Paste hot-key. This present a problem since there are two standards and some applications only support one of these standards. The good news is most applications support both standards, however there are some application that only support one and it isn't always the same. The two hot-key standards are:

- Paste using shift + insert
- Paste using ctrl + v

PentaCalc Pro has a default setting of Paste using ctrl + v.

An example of when you may use Quick Copy/Paste is when you are working in your word processor and need to make a calculation and paste it back at the cursor position of your word processor.

1. Press the **F11** key (or other hot-key as defined above.)

   PentaCalc Pro will instantly appear.

2. Make the calculation.

3. Press the hot-key.

   The number will be copied from **PentaCalc Pro**'s display and pasted at the cursor position of your word processor

4. Continue typing in your word processor.

See Also: Clipboard Support.
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Setting Warning Messages

PentaCalc Pro has several warning messages designed to alert you when a change is being made that may affect the data in **PentaCalc Pro**. To turn these messages off:

1. Select **Configure..**. from the **Option** menu.

   The "Configure" dialog box will appear.

2. Select **[Warning Messages]**.

   The Configure Warning Messages dialog box will appear:

3. Select which warning messages you would like to turn off.

   - **Warn of data changes when switching bases.** When switching from the decimal base to other bases it is possible to lose numbers to the right of the decimal place.
   - **Warn of lost stack when switching to Algebraic mode.** If you are in RPN mode and switch to Algebraic mode the stack will be lost.
   - **Are you sure you want to delete the button**. If you decide to delete a button, this message will appear confirming your request.
   - **Warn of unsaved data when closing the tape.** This message can become a real pain in the neck if you frequently select New Tape from the File menu.

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Using the Keyboard

Although **PentaCalc Pro** is designed to be similar to the handheld calculator you are used to, it takes advantage of the power your PC has to offer. The purpose of this section is to describe the operation of the many **PentaCalc Pro** features that are common to all calculators as well as those unique to the PC.

Accessing PentaCalc Pro's functions

PentaCalc Pro is easy to use with either a mouse or keyboard. Mouse users can use the calculator buttons by clicking on the button with the mouse cursor. Clicking on the button once automatically enters a number or performs the selected operation. Several keys on your computer keyboard have a special function they are:

Keys	Function
ctrl + tab	Moves from one interface to another on **PentaCalc Pro**.
tab	Toggles between buttons on a particular interface. tab will also move the cursor from field to field in the tape interface.
Arrow keys	Will move you up or down a line or left or right one character while in the tape interface.
Underlined letters	To operate the calculator with the keyboard, select the underlined letter in the function's name. For example, notice that the "T" on **[TAN]** is underlined. Pressing the "T" on your keyboard will serve the same purpose as clicking **[TAN]** with your mouse.
spacebar	**Reveals the hot-key for all buttons which don't have an underlined letter.** One example is **[„…]**. When spacebar is pressed, **[„…]** changes to a "q". Thus to take the square root of the number in the display, you may click on **[„…]** with your cursor or press the "Q" key on your keyboard.

There are several rules that govern how hot-keys for keyboard control are used with **PentaCalc Pro** they are:

- Due to the unlimited and changing number of buttons possible on **PentaCalc Pro**, a system has been devised for handling how hot-keys are assigned to various buttons. At all times the display interface and the standard calculator will be active. Since these two calculators are always active they are referred to as global calculators. It is also possible to have one other calculator active at the same time as the global calculators. This means you may use the button hot-keys on the display interface, the standard calculator and one other calculator at the same time.
- When creating buttons and assigning hot-keys, **PentaCalc Pro** will automatically check for conflicts with the global calculators and your new button. If the hot-key is already in use on one of the three calculators or a menu you will be prompted to select a new hot-key.
- If you have the global calculators and more than one other open at the same time, only one non-global calculator can be active. You may change which calculator is active by clicking on a different calculator or pressing it's hot-key. For example, lets assume that in addition to the global calculators you have the scientific and statistics calculators running. If scientific is active and you click on the statistics calculator it will become active and the title bar of the scientific calculator will become dim.
- It is possible to change which calculator is active by selecting the hot-key shown to the right of the title on the title bar. This makes it possible to switch between calculators very quickly. If a calculator doesn't have a hot-key, you may assign one by activating that calculator and then selecting Calculator Properties... from the File menu.

Changing a button hot-key

PentaCalc Pro ships with a hot-key for every button. If you wish to change any of these hot-keys

follow these steps:

1. Highlight the button you would like to edit by clicking on it with the right mouse button. -OR- press **ctrl + tab** then **tab**. Then do one of the following to bring up the button properties box:

   Click on the button again with the right mouse button.

   -OR-

   From the **File** menu select **Button Properties...**

   The **Button Properties dialog box** will appear.

2. Once the "Button Properties" dialog box appears, you may select a new hot-key. If the hot-key you select is already being used by another button on the calculator or one of the two global calculators, you will be prompted to select another hot-key.

3.After making the desired changes, select **[OK]**.

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Changing the Decimal Point

PentaCalc Pro offers four different display options which are found in the Option menu:

- Standard
- Fixed
- Scientific
- Engineering

If you select either Fixed, Scientific, or Engineering, a dialog box will appear requesting the number of decimal places between 0 and 15. By rounding only in the display, **PentaCalc Pro** minimizes rounding errors throughout your calculations.

Using Standard display

The number of decimal places changes with each number entered depending upon how many digits you enter after selecting the decimal point. **PentaCalc Pro** will always use the maximum number of digits in its calculations.

Using Fixed display

PentaCalc Pro will always show the number of digits to the right of the decimal place as specified. For example, if you have entered 4 digits in the fixed dialog box and then enter 2.3 it will be displayed 2.3000.

Using Scientific display

Scientific notation is useful when you are working with very large or very small numbers. Scientific notation writes these numbers concisely by using a smaller number (called a mantissa) multiplied by 10 raised to a power. Large numbers are raised to positive powers and small numbers are raised to negative powers. There are two ways of entering large numbers. The first is to enter a number as usual and **PentaCalc Pro** will automatically convert it to scientific notation if the answer to the operation cannot be displayed with 15 or fewer digits.

The second method involves entering a mantissa and exponent:

1. Enter the mantissa. If the mantissa is negative, select **[±]**.
2. Select **[EE]** to start the exponent.
3. Enter the exponent. If the exponent is negative, select **[±]**.

Example: Enter Avogadro's number, 6.02 X 1023

Enter	Display
6.02 **[EE]** 23	**6.02 e+23**

Using Engineering display

Engineering notation is very similar to scientific notation except all exponents are in multiples of three and **PentaCalc Pro** adjusts the exponent to keep the mantissa between 1,000 and -1,000. This form of notation is very useful for scientific and engineering calculations that are specified in multiples of 103 (such as micro-, milli-, and kilo- units).

Example: Enter Avogadro's number, 6.02 X 1023

Enter	Display
6.02 **[EE]** 23	**602.00 e 21**

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Doing Arithmetic

This section covers the basic methods of clearing data and performing arithmetic correctly.

Clearing the Tape and correcting errors

Two buttons are provided for clearing registers and correcting errors in the display:

Button	Explanation
[‹]	allows you to backspace incorrect digits from the number you are currently entering. You may also use the backspace key on your computer keyboard
[AC]	clears everything but the memory registers, this includes such registers as all the TVM registers. **[AC]** will not clear the tape, however. To clear the entire tape, you must select **New Tape** from the **File** menu.

Entering Data in the correct order

Since division and subtraction operations are noncommutative (you can't change the order of the numbers without affecting the answer), it is important that you enter the numbers in the correct order to get the correct answer. It doesn't matter what order the numbers are in for multiplication and addition calculations. Please examine the following examples which illustrate this principle.

Example: Calculate 983.34-345.98

Enter	Display
983.34	**983.34**
[-]	**983.34**
345.98	**345.98**
[=]	**637.36**

Example: Calculate 21 ™ 5.25

Enter	Display
21	**21.00**
[™]	**21.00**
5.25	**5.25**
[=]	**4.00**

Notice that the reverse order of the previous calculations doesn't produce the same result.

Using parentheses

Parenthesis are used when you want to postpone calculating with an intermediate result until you've entered more numbers.

Example: Calculate 26 ™ (13 - 7) ˜ 12

If you were to enter 26 [™] 13 [-] 7, **PentaCalc Pro** would calculate the intermediate result, -5. However, that is not what you want. To delay the division until the subtraction is complete, use parentheses:

Enter	Display
26 **[™] [(]** 13 **[-]** 7 **[)] [˜]** 12 **[=]**	52.00

Changing the sign of a number

To change a number from positive to negative or vice versa, select the [±] button.

Example: Calculate: 25 ˜ -2

Enter	**Display**
25 **[˜]** 2 **[±] [=]**	-50.00

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Clipboard Support

You can quickly transfer the results of a calculation between **PentaCalc Pro** and other Windows applications through the clipboard. The first method and the one we recommend is to use the Quick Copy/Paste feature which will make copying and pasting numbers much quicker. You can copy your final answer from **PentaCalc Pro** and paste it directly into another Windows application or copy a number from another Windows application and then paste it into **PentaCalc Pro** for final computation.

To copy numbers from PentaCalc Pro to another Windows application

1. Enter a number into the display.
2. From the **Edit** menu select **Copy**. The contents of **PentaCalc Pro**'s display are automatically copied to the clipboard. If you are in RPN mode, the number at the bottom of the stack will be copied.
3. Activate your Windows document (open the application, if necessary.)
4. Position the cursor where you want the answer to be placed.
5. Select **Paste** from the **Edit** menu of your document's application.

To Paste numbers from a windows application into PentaCalc Pro

1. From another Windows application, highlight the number to be copied.
2. From the **Edit** menu, select **Copy**.
3. Open or activate **PentaCalc Pro**.
4. From the **Edit** menu, select **Paste**. The number will appear in the display of **PentaCalc Pro**.

Quick copy/paste

Quick Copy/Paste is one of the most useful features of **PentaCalc Pro**. To setup Quick Copy/Paste:

1. Select **Configure...** from the **Option** menu.

   The Configure dialog box will appear.

2. Select **[Activate/Deactivate Key]**.

   The Activate/Deactivate Key dialog box will appear.

3. Check the Copy number from, and paste number to, previous application with Activate/Deactivate key option.

   If this option is selected you will be able to copy highlighted numbers from an application into **PentaCalc Pro**'s display when you select the Activate/Deactivate hot-key. You will also be able to copy a number from **PentaCalc Pro**'s display and paste it directly to your previous application.

4. Select a Copy/Paste standard.

PentaCalc Pro's Quick Copy/Paste function relies on other Windows application's Paste and Copy hot-keys. This may present a problem since there are two standards. The good news is most applications support both standards, however there are some application that only support one and it isn't always the same. The two hot-key standards are:

- Paste using shift + insert
- Paste using ctrl + v

PentaCalc Pro has a default setting of Paste using ctrl + v.

To use Quick Copy/Paste from any Windows application:

1. Press the F11 key (or other hot-key as defined above) and **PentaCalc Pro** will instantly appear.
2. Make any calculation.
3. Press the F11 key (or other hot-key as defined above) and the number will be copied from **PentaCalc Pro**'s display and pasted at the cursor position of your previous application ready for you to start typing again.

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Fractions

If you need to make calculations using fractional numbers, you will find **PentaCalc Pro**'s fraction capabilities very useful. **PentaCalc Pro** will accept fractional numbers as the input and produce a fractional number as the output. If a mix of fractions and decimal numbers are used in a calculation the results will be displayed in decimal form. A fraction is entered using **[']** and is only available in Decimal or Feet/Inches bases.

Configuring fractions

You have several ways to configure the output of fractions based on how you would like the denominator to appear. **PentaCalc Pro** will always compute the fraction with the least common denominator unless you would like the output in a different form. To configure the output of fractions:

1. Select **Configure...** from the **Option** menu.

   The **Configure dialog box** will appear.

2. Select the **[Fractions]** button.

   The Configure Fractions dialog box will appear.

3. You may enter a Base Denominator which will be used in the last two options. For example, if you enter 32 in the Base Denominator text box your calculations will be displayed in terms of 1/32. You have three ways to Display Fractions...

- **Exactly, disregarding Base Denominator**. The results of your calculations will be displayed as an exact fraction to the closest 1/32,768 of a unit. For example:

Calculate	Enter	Result
1/2 + 1/2	**1 [Ÿ] 2 [+] 1 [Ÿ] 2 [=]**	1.00
25/8 - 7/8	**2 [Ÿ] 5 ['] 8 [-] 7 ['] 8 [=]**	1 3/4
3/32 x 5/64	**3 [Ÿ] 32 [¯] 5 [Ÿ] 64 [=]**	15/2048
3/15 - 0.8245	**3 [Ÿ] 15 [-] 0.8245 [=]**	-0.6245
22/7 + 19/467	**22 [Ÿ] 7 [+] 19 [Ÿ] 467 [=]**	3 600/3269

- **Exactly, with denominators no larger than the Base Denominator**. This result is useful if you work with a certain minimum fraction. For example, if you are building a new deck for your house and you only want to measure the wood to a dimension of 1/8 of an inch or larger you would enter 8 as the Base Denominator and all of your fractions would come out not more precise than 1/8 of an inch.
  Before calculating the following example, set the Base Denominator to 8.

Calculate	Enter	Result
11/9 - 10/9	**11 [Ÿ] 9 [-] 10 [Ÿ] 9 [=]**	1/8
1/8 + 1/16	**1 [Ÿ] 8 [+] 1 [Ÿ] 16 [=]**	1/4

- **Always in terms of the Base Denominator**. Select this option if you would like your output to always be in a multiple of the Base Denominator. For example, if you have 5 as the Base Denominator, your fractional numbers will be rounded to the nearest 1/5. The possible fractional output will be: 1/5, 2/5, 3/5, or 4/5. If you input 64 as the Base Denominator then you will have 63 possible fractional numbers starting with 1/64 as the smallest and 63/64 as the largest.
  Before calculating the following example, set the Base Denominator to 16.

Calculate	Enter	Result
1/4 + 1/4	**1 [Ÿ] 4 [+] 1 [Ÿ] 4 [=]**	8/16
1/7 + 1/9	**1 [Ÿ] 7 [+] 1 [Ÿ] 9 [=]**	4/16

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New
Stores or calculates the new number.

%Chg
Stores or calculates as a percentage the change between the old and new number.

Total
Stores or calculates the total.

Part
Stores or calculates the part.

%Total
Stores or calculates the percentage portion that the part is to total.

Cost
Stores or calculates cost of item.

Mrk%
Stores or calculates markup as a percent of cost, or price based on **%Cst** or **%Sel** being checked.

Sell
Stores or calculates selling price of item.

Nom%
Stores or calculates the nominal interest rate.

Eff%
Stores or calculates the effective interest rate.

P/Yr
Stores the periods per year. This button only appears if the **Per** option is checked. **Con** should be selected of you desire to calculate continuous compounding.

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%Cst and %Sel
Click one of these buttons to determine markup as a percentage of cost or as a percentage of selling price

Per and Con
Periodical or continuous calculations.

Item Counter
If you are in 10-key notation, each time you press either **[Sub]** or **[Total]** an item count will appear to the left of the total. You have the option of having the item count increment by one each time you press **[+]** or of having it increment by one each time you press **[+]** and decrease by one each time you press **[-]**. You may select **Increment every add only** or **Increment on every add and decrement on every subtract**, by selecting the appropriate radio box.

Rounding
You may also specify what type of rounding options you would like:

- **Up** Results are rounded up to the number of significant digits indicated by selecting **Fixed...** from the **Option** menu.
- **5/4** Results are rounded up or down depending on the value. For example, if the number of significant digits is set to 2, a result is rounded up if the value in the third decimal position is 5 or more, or rounded down if 4 or less. See Also: Fractions
- **Down** Results are rounded down to the number of significant digits indicated by selecting **Fixed...** from the **Option** menu.

Straight line Selects the straight line depreciation method.

Sum of years digits Selects the sum of years digits depreciation methods.

Declining Balance Selects the Declining Balance depreciation method. When this method is selected, **[Factor%]** will appear.

Original Cost
Stores the depreciable-cost basis of the asset at acquisition.

Salvage factor
Stores the salvage value of the asset at the end of its useful life.

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Expected Life (Years)
Stores the working life of the asset.

Table
Generates a depreciation table of the asset.

Hot-key

- **None:** No keystroke will bring PentaCalc to the top. You must bring it to the top some other way.
- **Always on Top:** PentaCalc remains on top of all other non-"Always on top windows" (such as the clock.) Therefore, no hot-key is necessary to activate PentaCalc.
- **Custom:** Specifies the key which will activate and deactivate PentaCalc.

Clipboard

- Select the check box if you want the hot-key to cut and paste selected text when activating and deactivating PentaCalc.
- Select one of the two radio buttons to indicate you preferred method of cutting and pasting to the clipboard.

Factor%
When using the Declining Balance method, you must enter the declining balance factor as a percentage of the straight-line rate.

Ÿ
The fraction delimeter is used for entering fractions. See Also: Fractions

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Using the H:M:S for Angle Calculation Calculations

The Hours-Minutes-Seconds (HMS) base may be used for higher precision angle calculations which are often needed by surveyors, architects, and engineers, Using this base, hours represent full degrees, minutes represent 1/60th of a degree, and seconds represent 1/60th of a minute. For example, 45:30:00 is equal to 45.5 degrees. To do calculations with H:M:S angles, you must first change to the H:M:S base by selecting **Hours-Minutes-Seconds** from the **Options** Menu, enter the angle into the entry display, perform the calculation and change back to the Decimal base if you want the result in decimal.

Example: Computer 500 x Tan(35:25:47)

Make sure that you are in the Decimal base by selecting Decimal from the Option menu.

Enter	Display	Description
500 **[x]**	**500.00**	enter 500 and multiply
Hours-Minutes-Seconds	**500:00:00**	change to HMS base
35:25:47	**35:25:47**	enter the HMS angle
[Tan]	**00:42:41**	result of Tan
[=]	**355:43:19**	result of multiplication
Decimal	**355.72**	result in decimal

If you do a lot of this type of calculation, you may find it inconvenient to have to switch between Hours-Minutes-Seconds and Decimal using the Option menu. One solution is to create a couple of buttons to make switching between HMS and decimal base faster:

1. Create two operator buttons name HMS and DEC.
2. Create an operator to switch to decimal with the following keystrokes:

   [{}]

   Decimal

   [{}]

   [Sto] [DEC]
3. Press **[DEC]** at any time to change to the decimal base the process for creating the HMS operator is similar. For more information on creating operator buttons, See Creating Operator buttons..

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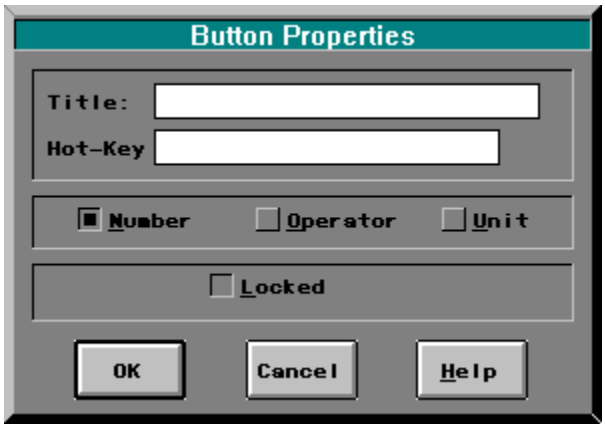
Button Properties

Click on the part of the calculator where the appears for a brief description



See Also: Calculator Properties, Creating a New Button, Creating an Operator Button, Button Properties (units)

Button Title
Enter the name you want to appear on the button.

Hot-key
Specifies a key which can be used to quickly execute your new button.

The hot-keys for buttons are limited to any key on the keyboard except extended keys such as F1-F12, INSERT, DELETE, etc. **PentaCalc Pro** will also accept CTRL + any key not on the extended keyboard as a hot-key.

Number: Used for constant buttons and storage registers

Operator: Used to assign a series of numbers and operators. The button becomes an operator like **[+]** and **[Tan]**

Unit: Used for unit conversions. See Unit Conversions.

Button Locked
Check this box to lock a button. Locking a button will prevent you from inadvertently changing its function. We recommend that storage buttons be left unlocked, since the purpose will be to frequently enter new information in the button.

Title
The name of the calculator.
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Hot-key
The key which will make the calculator active when PentaCalc is running.

Locked
This option prevents you from adding buttons to the calculator. See Also: Editing a Calculator

Menu
The selected box determines under which menu the calculator will appear.

Display

- **Exactly, disregarding Base Denominator**. The results of your calculations will be displayed as an exact fraction to the closest 1/32,768 of a unit. For example:
- **Exactly, with denominators no larger than the Base Denominator**. This result is useful if you work with a certain minimum fraction. For example, if you are building a new deck for your house and you only want to measure the wood to a dimension of 1/8 of an inch or larger you would enter 8 as the Base Denominator and all of your fractions would come out not more precise than 1/8 of an inch.
- **Always in terms of the Base Denominator**. Select this option if you would like your output to always be in a multiple of the Base Denominator. For example, if you have 5 as the Base Denominator, your fractional numbers will be rounded to the nearest 1/5. The possible fractional output will be: 1/5, 2/5, 3/5, or 4/5. If you input 64 as the Base Denominator then you will have 63 possible fractional numbers starting with 1/64 as the smallest and 63/64 as the largest.

Base Denominator
Determines the base of the fraction. For example, entering 32 will result in a base in terms of 1/32.

Messages

- **Warn of data changes when switching bases.** When switching from the decimal base to other bases it is possible to lose numbers to the right of the decimal place.
- **Warn of lost stack when switching to Algebraic mode.** If you are in RPN mode and switch to Algebraic mode the stack will be lost.
- **Are you sure you want to delete the button**. If you decide to delete a button, this message will appear confirming your request.
- **Warn of unsaved data when closing the tape.** This message can become a real pain in the neck if you frequently select New Tape from the File menu.

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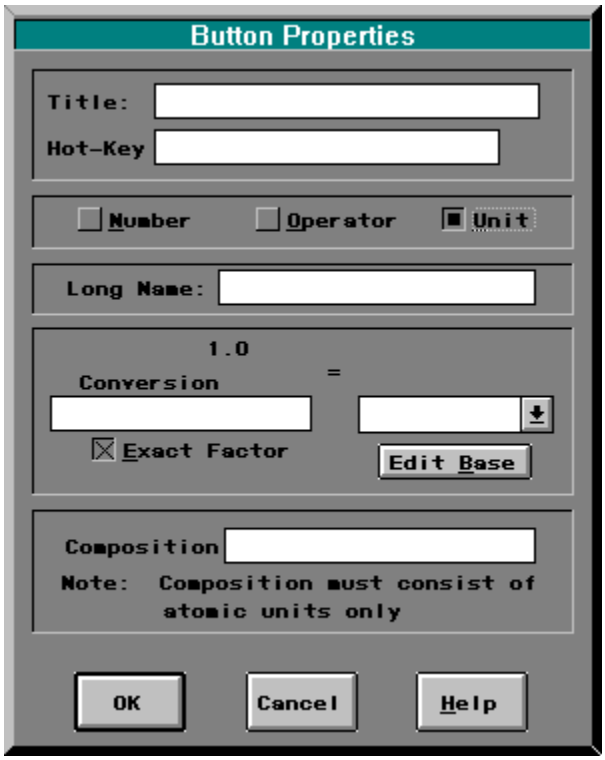
Button Properties (Units)

Click on the part of the dialog where the appears for a brief description.



See Also: Calculator Properties, Creating a New Button, Creating an Operator Button, Button Properties

Long Name
The long name will appear on the comment display of the tape interface when the newly created button is pressed. See Also: Creating a Unit Button

Conversion
Conversion Factor

Comp
The composition of the unit, which must consist of atomic units. When entering compositions, all numerator units must be to the left of the "/" and all denominator units must be to the right of the "/". Otherwise, units must be separated by an "*". Each unit may have an exponent between 2 and 9. The exponent must be positive. Smart Units will not accept any other operator or parenthesis. Smart Units will only accept unit names, * (multiply), / (divide), and ^ (for exponents). For example, you may enter: kg*m^2/s^2. You may not however enter two units of the same type. For example, ft^2/m is not allowed, since feet and meters are of the same unit type. See Also: Creating a Unit Button

Exact factor
Check this box if you know that multiplying the composition by the conversion will produce exactly one of the base unit. If the box is not checked, the conversion will be performed to the number of significant digits.

Conversion
Enter the value that, when multiplied by the composition, will equal one base unit. The base unit is entered in the Base combo-box above.

Base
Name of the base to configure.

Composition
Defines the base in term of special pre-defined units that PentaCalc understands.

Level 3: Try harder to find a match by converting bases to their S.I. compositions.
If Smart Units doesn't find an exact match using the logic outlined in the previous levels, it will start converting units to their S.I. bases. For example, if you perform a calculation in the form kg x in / s», Smart Units will first check kg and see that it is in terms of its S.I. base. It will then check inches and convert it to the S.I. base, meters and then check for an exact match and will find one with the S.I. unit of Newtons.

Level 2: Try to find a match by converting units to their bases.
If Smart Units doesn't find an exact match it will systematically convert each unit to its base until it finds a match. For example, if you perform a calculation in the form lb x in/s», Smart Units will first check for an exact match using the method outlined in level one. Since it wouldn't find a match. Smart Units will then check lb and confirm it is in its base of lb already. It will then check inches, discover it needs to be in feet and convert it. It will then search for a match and this time will find one with lbf (pound force) and output the result in lbf.

Level 1: Convert if they match the composition of another unit.
This option will only search for an exact match to the units as entered. For example, if you perform a calculation in the form; lb x ft / s» the output will be in lbf (pound force). This is because it is an exact match. If you were to substitute inches in the place of feet, Smart Units would output in lb x in/ s» which is the unsimplified version since there is no match.

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Don't convert at all, display as a combination.
There will be no simplification or canceling of units. For example, if you perform a calculation in the form kg x m /s» the output will come out exactly in that form. It will not simplify to the S.I. unit of Newtons.

[Xmin][Xmax]
Used to specify the minimum and maximum values of x for a particular graph.

Grid On/Off
Used to turn the graphing background grid on or off.

[Ymin] [Ymax]
Used to specify the minimum and maximum values of y for a particular graph.

[‹] [•] [Œ] [Ž]
Control buttons for scrolling left, right, up and down within a graph.

Scale +/-
Used to zoom a graph in and out.

Print
Prints the current graph.

Copy
Copies the graph to the clipboard as a bitmap image.

Unit Name
Name of the unit for which to search. See Also: Creating Units, Unit Composition

Composition
Specifies the composition of the selected unit. See Also: Creating Units, Unit Composition

Search
Searches for either the given Unit Name or Composition. See Also: Creating Units, Unit Composition

Preferred
Specifies the preferred units output. See Also: Creating Units, Unit Composition

Main Menu
The main menu. See Menu Items for more information.

Tape Display
A running record or your calculations, regardless of the mode you are in. See Also: Using the Tape

Display.

Entry Display

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